2021

Tom na Clach Wind Farm Extension

Appendix 12.A: Report on Ornithological Surveys April 2014 to August 2015

Natural Research Projects,
Brathens Business Park,
Hill of Brathens,
Glassel,
Banchory
AB31 4BY

01330 826880

December 2021

Natural Research (Projects) Ltd. Company registered in Scotland: SC213640
Registered Office: 14 Carden Place, Aberdeen, AB10 1UR

Appendix 8.1 Ornithology Technical Report

1. Introduction

1.1 This report details the ornithological survey work undertaken at the site of the proposed Tom nan Clach Wind Farm Repowering (the Proposed Development) by Natural Research (Projects) Ltd (NRP) from April 2014 to August 2015.

1.2 The objectives of the study were to:

- Map the distributions of breeding birds, including scarce species listed in Annex 1 of the EU Birds Directive (2009/147/EEC) on the Conservation of Wild Birds 1979 (the Birds Directive) or Schedule 1 of the Wildlife and Countryside Act 1981 (WCA);
- Quantify the level of bird flight activity by breeding and foraging birds of potential conservation importance; and
- Record the presence and abundance of other birds of conservation importance (those listed in Biodiversity Action Plans (BAPs) or on the Red List of Birds of Conservation Concern (BoCC) (Eaton *et al* 2009) throughout the year.

2. Desk Study and Consultation

2.1 The site is not statutorily designated at international or national levels for ornithological interests. The nearest designated areas for birds are Kinveachy Forest Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI) (approximately 11 km south) which is designated for breeding capercaillie (*Tetrao urogallus*) and Scottish crossbill (*Loxia scotica*) (SPA) and for the pine wood breeding bird assemblage (SSSI only).

2.2 Ornithological information for the area was requested in 2014 and 2015 from the Highland Raptor Study Group (HRSG).

2.3 Consultation was also completed via the request for a Scoping Opinion from Scottish Natural Heritage (SNH) and the Royal Society for the Protection of Birds (RSPB) (Table 1). Further consultation regarding the survey effort required was sought from SNH in April 2015.

Table 1 – Consultations

Consultee	Scoping/ Other	Issue Raised	Response/Action taken
SNH	Scoping	"*…recommend a four visit version of Brown & Shepherd methodology, rather than the two visit methodology that would have been used for the original scheme*".	A four visit methodology was used for the recent surveys.
		"*The scoping report also says they will include the original survey work. The applicant should be aware this work is now out of date and should*	The assessment of impacts has been based on current baseline surveys

Consultee	Scoping/ Other	Issue Raised	Response/Action taken
		only be used for context. The assessment of impacts should be based only on the latest survey work".	but has also referenced those of the previous surveys where considered useful.
		"*A pair of golden eagles has been seen further down the Findhorn valley. The regional (NHZ) population of this species is currently in an unfavourable conservation status. The applicant will need to get up to date information from HRSG in order to assess the impact of this proposal on this species*".	The HSRG was contacted for further information and they had no knowledge of this pair. No other pairs were known to the HRSG within 6 km of the Proposed Development.
		"*The assessment should consider the impacts both as an individual scheme and in combination with all other operational, consented and proposed schemes which impact on this population*".	The assessment includes these potential impacts on the NHZ population.
		"*The North of Scotland red kite population is also in an unfavourable conservation status and an assessment of the impact of this proposal on this species should also be undertaken. The situation with red kites in the area has changed over the years"*.	A population viability analysis has been completed. See Appendix 8.4.
SNH	Other	SNH were approached to confirm that the proposed Vantage Point locations and coverage was adequate.	SNH agreed with the selected locations therefore these were used.
SNH (pre-application meeting with THC)	Other	SNH had requested two years of baseline surveys, however after an analysis was completed showing results after 12 months and comparison with survey data from 2006 and 2008 a request was made in reply to limit survey effort to 18 months (covering two breeding seasons and 1 non-breeding season).	SNH agreed to survey effort comprising two breeding seasons and one non-breeding season.
RSPB	Scoping	"*Golden plover and other moorland waders should be surveyed over two full breeding seasons following current SNH guidelines. An analysis of potential losses due to the application – individually and cumulatively with other developments should be provided*".	Two seasons were surveyed. The assessment includes these potential impacts on the NHZ population.

Consultee	Scoping/ Other	Issue Raised	Response/Action taken
		"*…an analysis made of impacts on the NHZ population (of golden eagle) of collision and displacement*".	The assessment includes these potential impacts on the NHZ population.
HRSG	Other	Request was made for information on golden eagles, red kites and other raptor species.	Regular contact with RSG has been maintained and information obtained.

3. Study Areas and Survey Periods

3.1 The study area for ornithological surveys relevant to the Proposed Development is situated on open heather moorland, managed for grouse shooting. Within a 2 km buffer of the Proposed Development turbines there is a small proportion of established plantation conifer forest.

3.2 The Proposed Development lies mostly within the boundary of the previously consented Tom nan Clach wind farm (the 'Permitted Scheme'). Ornithological surveys were completed between September and October 2005, April to July 2006 and April 2008 to July 2009 for this original application. Therefore two breeding seasons have already been completed. These data are reported on in full in the original EIA (Infinergy 2009a) and Addendum (Infinergy 2009b) and therefore are not mentioned further in this Technical Appendix (TA).

3.3 A further full 17 months of survey were completed for a slightly enlarged study area between April 2014 and August 2015. These data are reported in this TA. Some birds range over large areas and are therefore potentially vulnerable to the effects of wind farm developments a considerable distance away. Hence the ornithological study area encompassed a series of survey boundaries extending up to 2 km from the site. These boundaries defined the study area for surveys of certain species or for a particular survey method i.e. 500 m for flight activity, for breeding passerines and waders, and for wintering birds; 1 km for breeding barn owl and goshawk; 1.5 km for black grouse; 2 km for other breeding raptors and short-eared owl. In addition a 6 km boundary was used for golden eagle data (Figure 8.1).

3.4 The proposed turbine layout differs from the area used for survey design, therefore, to ensure that only survey results relevant to the final Proposed Development are reported on, and the proposed layout has been buffered accordingly and results tailored to those buffers where possible (Figure 8.2).

4. Field Survey Methods

4.1 The field surveyor was J. Clarke assisted by F. Leckie, S. Pinder, R. Stakim and K. Duffy. Field surveyors received extensive training prior to and during survey work. Training included the various survey methods, techniques to minimise fieldworker effects on bird detection, and the classification of bird behaviour. Training was provided irrespective of surveyors' previous experience. Emphasis

was placed on the importance of carrying out surveys in a systematic and standardised way to enable direct comparison of data from different survey periods and sites.

Flight Activity

4.2 Information on bird flight activity was collected during timed watches from strategic Generic Vantage Points (GVPs) using the methods described by Band *et al* (2007). Three GVPs were selected through a mix of GIS analysis and field trials, with the aim of maximising ground visibility within the 500 m flight activity survey area using the minimum number of vantage points (Figure 8.3).

4.3 In order to select flights for potential inclusion in a Collision Risk Model (CRM) (Band *et al* 2007), flight activity data were extracted and reported in respect of a 500 m buffer around a polygon formed by the outermost of the 13 turbine locations of the Proposed Development. This area is termed the Flight Activity Assessment Area (FA).

4.4 The 500 m survey boundary measured 9.89 km^2 whereas the FA measures 4.90 km^2. For the FA the area observed from at least one GVP measures 4.83 km^2, a spatial coverage of 98.6 % at 20 m above ground level with a 2 km cut-off (Table 2).

Table 2 - Generic Vantage Point Locations and Area Visible (km^2) within the 500 m buffer of the proposed turbines (FA)

GVP	Grid Reference	Area Visible (2 km cut-off)
1	NH 87389 36668	1.98
2	NH 87644 34203	1.54
3	NH 85041 34346	3.12
Total		6.64
Total not including overlapping areas		4.83

4.5 Observers at GVPs positioned themselves to minimise their effects on bird behaviour. A viewing arc not exceeding 180º was scanned. Watches were undertaken during daylight hours by a single observer in a wide range of weather conditions, mainly in conditions of good ground visibility (>2 km) and when the cloud base was higher than most elevated parts of the survey area.

4.6 GVP observations were completed in the 17 month period of April 2014 to August 2015. Observations were stratified across three daylight periods (termed 'early', 'middle' and 'late') to allow for diurnal variation in activity rates. The timing of watches within each period was adjusted each month in accordance with sunrise and sunset times (Annex 1.1). In total a minimum of 37 hours was undertaken from each during the breeding period (April to August) and a minimum of 38 hours in the non-breeding period (September to March) (Table 3a-c, Annex 1.2). A wide range of weather conditions were sampled including rain and snow showers, cloud cover from 0 to 100 % and wind speeds up to Beaufort Force 6 (Annex 1.3).

Table 3a - Summary of Monthly GVP Effort with Early, Middle and Late stratification for breeding season 2014 (Data are Hours of Observation).

GVP	EML	Apr	May	Jun	Jul	Aug	Total
1	E	1.50	1.50	1.50	1.50	1.50	7.50
	M	4.50	5.00	5.50	5.00	4.50	24.50
	L	1.50	1.50	1.50	1.50	1.50	7.50
Total		7.50	8.00	8.50	8.00	7.50	39.50
2	E	1.50	1.50	1.50	1.50	1.50	7.50
	M	4.50	5.00	5.00	5.00	4.50	24.00
	L	1.50	1.50	1.50	1.50	1.50	7.50
Total		7.50	8.00	8.00	8.00	7.50	39.00
3	E	1.50	1.50	1.50	1.50	1.50	7.50
	M	3.00	5.00	5.00	5.00	4.50	22.50
	L	1.50	1.50	1.50	1.50	1.50	7.50
Total		6.00	8.00	8.00	8.00	7.50	37.50

Table 3b - Summary of Monthly GVP Effort with Early, Middle and Late stratification for non- breeding season 2014/2015 (Data are Hours of Observation).

GVP	EML	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
1	E	1.50	1.00	1.00	.	.	1.00	1.50	6.00
	M	4.50	3.50	3.00	3.50	2.00	5.50	4.00	26.00
	L	1.50	1.00	1.00	1.00	1.00	1.00	1.50	8.00
Total		7.50	5.50	5.00	4.50	3.00	7.50	7.00	40.00
2	E	1.50	1.00	1.00	1.00	1.00	.	2.50	8.00
	M	3.50	4.50	3.00	2.50	2.00	.	7.00	22.50
	L	1.50	1.00	1.00	1.00	.	.	3.00	7.50
Total		6.50	6.50	5.00	4.50	3.00	.	12.50	38.00
3	E	1.50	1.00	1.00	1.00	1.00	.	1.50	7.00
	M	4.50	3.50	3.00	3.50	3.00	4.50	4.00	26.00

GVP	EML	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
	L	1.50	1.00	1.00	.	1.00	1.00	1.50	7.00
Total		7.50	5.50	5.00	4.50	5.00	5.50	7.00	40.00

Table 3c - Summary of Monthly GVP Effort with Early, Middle and Late stratification for breeding season 2015 (Data are Hours of Observation).

GVP	EML	Apr	May	Jun	Jul	Aug	Total
1	E	1.50	1.50	1.50	1.50	1.50	7.50
	M	4.50	5.00	5.00	5.00	4.50	24.00
	L	1.50	1.50	1.50	1.50	1.50	7.50
Total		7.50	8.00	8.00	8.00	7.50	39.00
2	E	1.50	1.50	1.50	.	1.50	6.00
	M	4.50	5.00	5.00	6.50	6.00	27.00
	L	1.50	1.50	1.50	1.50	.	6.00
Total		7.50	8.00	8.00	8.00	7.50	39.00
3	E	1.50	1.50	1.50	.	0.50	5.00
	M	2.50	7.00	5.00	6.50	3.50	24.50
	L	1.50	1.50	1.50	1.50	1.50	7.50
Total		5.50	10.00	8.00	8.00	5.50	37.00

4.7 During each watch three hierarchical recording methods were used, as follows:

- Focal bird sampling – timed. The viewing arc was scanned constantly until a *Target A species*[1] was detected in flight. Once detected, the bird was followed until it ceased flying or was lost from view, with the duration of the flight recorded to the nearest second. The route followed by the bird was plotted in the field onto a 1:25,000 scale map, with the direction of flight indicated regardless of whether or not the bird was within the survey area. The bird's flying elevation above the ground was estimated at the point of detection and at 15 second intervals thereafter, using a countdown timer with an audible alarm. Flying elevation was classified as less than 10 m, 10 m to 30 m, 30 m to 50 m, 50 m to 100 m, 100 m to 150 m and greater than 150 m. Where simultaneous flight activity by a number of birds was

[1] *Target A species* were drawn from those listed in Annex 1 of the Birds Directive and Schedule 1 of the WCA. See Annex 1.4 for a full list.

observed and it was not possible to plot individual flight lines, areas of flight activity were plotted on the field maps.

- Focal bird sampling – untimed. The same scanning procedure as described above was used. However flights of *Target B species*[2] were not timed, instead the flight path was mapped and flying elevation was recorded at the start and when it changed during the recorded bout. Where a flock was observed a central flight line representative of the route was estimated.
- Activity Summaries. At the end of each five minute period flight activity within the survey area by species of lesser conservation importance (*Target C species*)[3] was summarised. The number of birds recorded in any one period was the minimum number of individuals that could account for the activity observed. The height, direction and number of individuals involved in notable bird movements (e.g. gull flights) were recorded.

4.8 Data were entered in the field onto recording sheets and later transferred to Microsoft Excel spreadsheets. Maps of flight activity by Target Species were compiled for each watch. Each flying bout was numbered and cross-referenced to the relevant flight path on the map.

Migratory Movements

4.9 Watches were undertaken from two Migration Watch Points (MWPs), with the main aim of recording movements by geese, swans and waders at a landscape scale. These points gave a good broad spatial coverage of the site in respect of birds moving on a predominantly north – south axis. Observations totalling 36 hours were undertaken in autumn 2014 plus 29 hours in spring 2015. (Table 4, Annex 1.5). A range of weather conditions were sampled including rain and fog and wind speeds up to Beaufort Force 6 (Annex 1.6).

Table 4 - Summary of Extra Migration Period Watches – Locations and Effort

MWP	Grid Reference	Sep	Oct	Nov	Mar	Apr	May	Total
A	287194, 834914	2.00	18.50	15.50	.	.	.	36.00
B	286425, 834862	.	.	.	9.00	17.00	3.00	29.00

Scarce Breeding Birds

4.10 Priority was given to detecting the species considered most likely to breed in the area: hen harrier (*Circus cyaneus*), merlin (*Falco columbarius*), peregrine (*Falco peregrinus*) and short-eared owl (*Asio flammeus*). To avoid disturbance the HRSG was consulted on any potential raptors breeding in the area including golden eagle (*Aquila chrysaetos*) breeding locations within a 6 km survey boundary. Checks for black grouse (*Tetrao tetrix*) were completed within suitable habitats at lower altitudes near the proposed main access route, and at areas

[2] *Target B species* were migratory birds of conservation importance, in this instance geese and certain waders. See Annex 1.4 for a full list.

[3] See Annex 1.4

identified in the current estate Moorland & Muirburn Management Plan (Cawdor Estate 2012).

4.11 In addition to the watches and the breeding birds of open ground surveys, 57.50 hours were spent searching for evidence of scarce breeding birds in 2014/2015 (Table 5).

4.12 Surveys for hen harrier, merlin, peregrine and short-eared owl were undertaken within the 2 km survey boundary, whilst for black grouse a 1.5 km boundary was utilised.

Hen harrier

4.13 Survey methods in Hardey *et al* (2009) were followed, with emphasis given to any stands of tall heather.

Merlin

4.14 Survey methods in Hardey *et al* (2009) were followed, with emphasis given to any stands of tall heather, boulders, hummocks, bushes and trees including old crows nests (which could be re-used by merlin) were checked for signs of occupation (e.g. plucked prey, moulted feathers, pellets and faeces).

Peregrine

4.15 Survey methods in Hardey *et al* (2009) were followed. All potential nests sites were visited and checked for occupation. All crags and steep banks identified from OS maps and ground searches were checked. Surveyors looked for birds or signs of occupation (e.g. faecal splash, fresh plucks).

Short-eared owl

4.16 Survey methods in Hardey *et al* (2009) were followed. Emphasis was given to stands of tall heather.

Black grouse

4.17 Methods followed those in Gilbert *et al* (1998). Areas of suitable habitat were visited to search for signs of occupation (droppings, feathers) during the winter months and then again during spring to locate and count any displaying (lekking) males. Spring visits were made within two hours of dawn from 15 April in dry, calm weather with good visibility. Surveyors listened and scanned carefully for lekking males.

Table 5 - Details of Survey Effort Searching for Scarce Breeding Birds including Black Grouse, plus Associated Weather

(Cloud 10ths, Cloud base, Wind Direction, Wind Force, Precipitation code*, visibility (km)) * Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog)

Date	Obs	Start	Finish	Duration	Weather	Surveys
17/04/2014	JAC	1645	1745	1.00	9,800,NW ,5,nil,10	No signs of divers on or around lochan.

Date	Obs	Start	Finish	Duration	Weather	Surveys
05/05/2014	JAC	1500	1630	1.50	10,1000,SW,5,nil,10	Check for merlin, goshawk, nil.
06/05/2014	JAC	1400	1700	3.00	2,1000,SW,3,nil,10	Check for peregrine, nil.
27/05/2014	FL	0900	0930	0.50	9,1000,-,0,nil,20	Checked where merlin seen in April, nil signs.
27/05/2014	FL	1130	1200	0.50	10,1000,-,0,nil,20	Check for peregrine, no signs.
30/05/2014	JAC	1000	1200	2.00	1,1200,SW,2,nil,10	Check for peregrine & merlin, no signs.
17/06/2014	RAS	1730	2030	3.00	7,1500,N,4,nil,5	Check for merlin, peregrine & short-eared owl, nil.
19/06/2014	RAS	1400	1530	1.50	10,700,NW,4,nil,5	Check for merlin, peregrine & short-eared owl, nil.
20/06/2014	JAC	0515	0545	0.50	10,800,W,4,nil,10	Check for short-eared owl, nil.
23/06/2014	JAC	1000	1230	2.50	8,800,W,3,nil,10	Check for merlin, nil.
30/06/2014	JAC	1315	1515	2.00	10,800,NW,1,ILR,10	Check for merlin near where male seen recently, nil.
14/08/2014	JAC	0830	0930	1.00	10,700,W,3,nil,10	Check for diver, nil.
19/08/2014	JAC	1700	1800	1.00	8,800,NW,3,IHR,10	Check for peregrine, possible site located.
26/09/2014	JAC	1000	1300	3.00	4,800,W,5,nil, 10	Check for peregrine at historical nest, signs of roost this year.
24/10/2014	JAC	1030	1300	6.00	7,800,W,4,ILR,10	Check for peregrine and golden eagle at historical nest, peregrine roost used this year, eagle eyrie not used.
13/01/2015	JAC	1000	1630	1.75	8,800,SW,4, IHS,10	Check for peregrine and golden eagle, individuals of both in area.

Date	Obs	Start	Finish	Duration	Weather	Surveys
24/01/2015	JAC	1230	1145	2.00	7,800,W, 4, ILS,10	Check for golden eagle at historic nest site, no signs.
14/02/2015	JAC	1330	1430	2.00	9,700,SW ,3,nil,10	Check for golden eagle at historic nest site, no signs.
17/02/2015	JAC	0930	1530	2.00	7,1000,S W,4,nil,10	Check for golden eagle at historic nest site, bird in area.
27/03/2015	JAC	1230	1130	0.75	8,1000,S W,5,nil,10	Check for peregrine and golden eagle at historical nests, no signs.
29/03/2015	JAC	0900	1315	2.00	8,800,W, 2,nil,10	Check for goshawk, no signs.
06/04/2015	JAC	0600	0730	1.50	3,1200,S, 3,nil,10	11 males, lekking amongst fire damaged trees.
06/04/2015	JAC	0830	1100	1.00	4,1200,S, 3,nil,10	Check for golden eagle at possible nest site, none seen.
06/04/2015	JAC	1000	0930	3.00	4,1200,S W,4,nil,10	Check for golden eagle at historic nest site, no signs.
07/04/2015	JAC	1400	1300	2.50	7,1000,S W,4,nil,10	Check for peregrine and golden eagle at possible nest site, no signs.
08/04/2015	JAC	1500	1630	1.00	2,1200,S W,5,nil,10	Check for merlin, male seen.
28/04/2015	JAC	0930	1600	1.50	4,1000,W ,4,nil,10	Check for peregrine and golden eagle at historical nests, recent peregrine roost, no eagle signs.
13/05/2015	JAC	0445	0600	1.25	7,1000,N W,3,ILR,1 0	12 males, flushed by great black-backed gull, then returned to lek.
15/05/2015	JAC	0530	0600	0.50	1,1200,S W,4,nil,10	Check possible lek location from HMP, no signs or birds found.

Date	Obs	Start	Finish	Duration	Weather	Surveys
23/05/2015	JAC	0930	1030	1.00	1,1200,SW,3,nil,10	Check for goshawk, no signs.
27/05/2015	JAC	0830	1100	2.50	8,800,W,5,nil,10	Check for merlin, no signs.
04/06/2015	JAC	1600	1700	1.00	10,800,SW,3,ILR,10	Check for merlin, male present.
11/06/2015	JAC	1445	1615	1.50	2,1200,W,2,nil,10	Check for peregrine and golden eagle at possible nest site, no signs.
29/06/2015	JAC	1000	1200	2.00	9,800,SW,3, ILR,10	Check for merlin, pair present.
29/06/2015	JAC	1400	1600	2.00	9,800,SW,3,nil,10	Check for merlin, pair present.
07/07/2015	JAC	1230	1330	1.00	10,600,NE,3,IHR,5	Check for merlin, pair present.
14/07/2015	JAC	1000	1100	1.00	9,800,NW,3,nil,10	Check for merlin, pair present plus 2 fledged juveniles.
27/07/2015	JAC	1300	1600	3.00	10,800,NE,3,nil,10	Check for peregrine and golden eagle at possible nest site, no signs of peregrine this year, some sticks from this year on eagle ledge only.
04/08/2015	JAC	1630	1730	1.00	7,1000,SW,5,ILR,10	Check for peregrine and golden eagle at possible nest site. Adult peregrine seen in flight.

Breeding Birds of Open Ground

4.18 Surveys were completed using a four visit adapted Brown & Shepherd (1993) method for upland waders. These visits were completed between mid-April and July, in both 2014 and 2015, within a 500 m survey boundary of the proposed turbines and the proposed main access route (Figure 8.1). Selected bird species were surveyed namely those included on Annex 1 of the Birds Directive, Schedule 1 of the WCA, Red-listed BoCC and those listed on the UK and local BAPs together with selected other species (see Annex 1.7 for a full list).

4.19 Surveys were completed four times between April and July to allow for differences in detection rate between early and late breeding species (Table 6). Fieldwork was not undertaken in conditions considered likely to affect bird detection, for example, strong winds (greater the Beaufort Force 5), persistent precipitation, poor visibility (less than 300 m) or in unusually hot or cold temperatures.

4.20 The survey aimed to cover the ground systematically with a constant search effort. All points within the survey areas were approached closely typically to within 100 m. Patches of scrub, isolated trees, rocky outcrops and streams were investigated closely and surveyors paused at regular intervals to scan and listen for calling and singing birds. Careful attention was given to recording behaviour indicative of breeding with care taken to avoid counting the same individual more than once.

4.21 The location and activity of birds were mapped onto enlarged 1:25000 scale OS maps using standard BTO codes (Marchant 1983). The position of each bird was mapped at the point of first detection and flight lines recorded. At the end of each visit, a summary map was compiled showing the locations of each identified territory or breeding pair. The following evidence was considered diagnostic of breeding: song, courtship or territorial display; territorial dispute; nest building and hole excavation; agitated behaviour by adult bird(s) indicative of the presence of a nearby nest or young (e.g. repetitive alarm calling, distraction display); adult(s) carrying food; presence of newly fledged young; adult(s) removing faecal sac.

4.22 Where a number of breeding individuals were present and it was not possible to determine the exact number of breeding pairs, a method was devised to allow the number of discrete territories to be estimated. Registrations of individual birds were deemed to represent discrete breeding territories / pairs if the distance between them was more than 250 m (500 m for curlew, 200 m for small passerines). Whilst it is recognised that these distances are arbitrary and the territory size varies both inter- and intra- specifically, this approach produces a standardised index of abundance based on the distance that members of a breeding pair are likely to move during the survey period. In cases where two individuals were considered to constitute a pair of birds, the location of the pair was placed centrally by convention.

4.23 Population estimates were derived by comparing the summary maps for the four survey visits. Again a method was devised whereby discrete territories could be estimated. Territories plotted during each visit were considered to be separate from one another if they were located more than 1000 m apart (500 m for snipe, common sandpiper and skylark, 300 m for other small passerines). These distances were chosen to reflect the distances birds could plausibly move between survey dates. The locations of territories mapped in more than one survey period were plotted centrally.

Table 6 - Survey Effort for Breeding Birds of Open Ground and Associated Weather in 2014 and 2015

(Cloud 10ths, Cloud base, Wind Direction, Wind Force, Precipitation code*, visibility (km)) * Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog)

Date	Survey Period	Obs	Start	Finish	Duration	Weather
08/04/2014	1	FL	1420	1620	2.00	5,800,W,4,nil,20
16/04/2014	1	SJP	1000	1400	4.00	10,1000,SW,5,nil,10
16/04/2014	1	JAC	1015	1430	4.25	9,1000,W,5,nil,10
18/04/2014	1	FL	0910	1630	7.33	0,-,W,2,nil,20
22/04/2014	1	JAC	1200	1300	1.00	10,600,E,3,nil,1
22/04/2014	1	JAC	1430	1730	3.00	9,800,E,4,nil,5
28/04/2014	1	JAC	1400	1600	2.00	1,1200,SE,3,nil,10
29/04/2014	1	JAC	1115	1615	5.00	10,400,NE,2,CLF,1
13/05/2014	2	JAC	1100	1315	2.25	7,800,NW,3,nil,10
13/05/2014	2	JAC	1545	1715	1.50	7,800,NW,3,nil,10
20/05/2014	2	JAC	1030	1500	4.50	3,1200,S,3,nil,10
26/05/2014	2	JAC	0900	1430	5.50	8,700,SE,2,ILR,10
27/05/2014	2	FL	0830	1600	7.50	10,1000,N,1,nil,20
27/05/2014	2	JAC	1000	1700	7.00	9,700,SE,2,ILR,10
28/05/2014	2	JAC	1530	1830	3.00	10,800,E,3,nil,10
29/05/2014	2	JAC	1030	1730	7.00	8,800,SE,3,nil,10
16/06/2014	3	JAC	1500	1530	0.50	9,1000,N,3,nil,10
16/06/2014	3	JAC	1700	1900	2.00	9,1000,N,3,nil,10
16/06/2014	3	JAC	2030	2045	0.25	9,1000,N,3,nil,10
17/06/2014	3	RAS	1300	1730	4.50	6,1500,N,4,nil,5
17/06/2014	3	JAC	1515	1900	3.75	6,1000,N,3,nil,10
19/06/2014	3	RAS	1000	1400	4.00	10,700,NW,4,nil,5
19/06/2014	3	JAC	1000	1130	1.50	9,800,NW,4,nil,10
19/06/2014	3	JAC	1400	1545	1.75	8,800,W,3,nil,10

Date	Survey Period	Obs	Start	Finish	Duration	Weather
20/06/2014	3	JAC	1000	1300	3.00	8,800,W,4,nil,10
24/06/2014	3	JAC	1600	2030	4.50	4,1000,E,3,nil,10
07/07/2014	4	JAC	1130	1315	1.75	7,800,SW,4,ILR,10
07/07/2014	4	JAC	1515	1800	2.75	7,800,SW,4,ILR,10
08/07/2014	4	JAC	1000	1630	6.50	8,800,N,2,IHR,10
15/07/2014	4	JAC	1615	1630	0.25	9,800,W,3,nil,10
15/07/2014	4	JAC	1800	1930	1.50	7,1000,W,2,nil,10
15/07/2014	4	JAC	2100	2115	0.25	6,1000,W,2,nil,10
18/07/2014	4	JAC	0945	1345	4.00	3,1200,SE,4,nil,10
22/07/2014	4	JAC	0930	1030	1.00	2,1500,SW,2,nil,10
22/07/2014	4	JAC	1645	1930	2.75	4,1000,N,2,nil,10
23/07/2014	4	JAC	1120	1220	1.00	2,1200,N,2,nil,10
23/07/2014	4	JAC	1420	1620	2.00	2,1200,N,2,nil,10
24/07/2014	4	JAC	1030	1700	6.50	3,1200,S,2,nil,10
28/07/2014	4	JAC	1030	1615	5.75	7,1000,NW,2,nil,10
01/05/2015	1	JAC	1000	1100	1.00	8,800,NE,3,ILH,10
01/05/2015	1	JAC	1300	1345	0.75	10,600,N,4,IHS,2
04/05/2015	1	SJP	1115	1850	7.58	2 1000 SW 3 nil 10
04/05/2015	1	FL	1125	1610	4.75	4 1000 SW 4 nil 10
04/05/2015	1	FL	1645	1850	2.08	4 1500 SW 4 nil 10
05/05/2015	1	JAC	0800	0915	1.25	10,800,E,4,nil,10
05/05/2015	1	JAC	0930	1345	1.75	10,800,E,5,CLR,10
05/05/2015	1	SJP	0820	1140	3.33	10 700 E 4 ILR 5
05/05/2015	1	FL	0820	1150	3.50	10 800 E 3 ILR 10
26/05/2015	2	JAC	0830	1630	8.00	9,800,W,4,ILR,10
26/05/2015	2	SJP	0840	1510	6.50	10,700,W,4,ILR,5
26/05/2015	2	FL	0900	1700	8.00	10,700,W,4,nil,5

Date	Survey Period	Obs	Start	Finish	Duration	Weather
16/06/2015	3	JAC	1030	1630	6.00	10,800,SW,3,IHR,10
16/06/2015	3	FL	1030	1555	5.42	10,500,SW,4,nil,10
17/06/2015	3	JAC	0900	1110	2.17	9,800,SW,5,nil,10
17/06/2015	3	FL	0920	1250	3.50	9,800,SW,5,nil,10
17/06/2015	3	JAC	1310	1530	2.33	9,800,SW,5,nil,10
09/07/2015	4	JAC	1000	1530	5.50	9,1000,W,4,nil,10
14/07/2015	4	JAC	0900	1630	7.50	9,800,NW,3,nil,10
14/07/2015	4	SJP	0900	1630	7.50	9,800,NW,3,nil,10

Autumn / Winter Walkover Surveys

4.24 Walkover surveys were undertaken during four months. These surveys were designed to counter balance surveys of breeding birds undertaken during the spring and summer and occurred within the 500 m survey boundary. As for breeding bird surveys, surveys concentrated on selected species.

4.25 Walk routes meandered to encompass as much ground as practical, in particular features of potential ornithological interest such as streams, marshes and trees. Where practicable surveyors used a different route to maximise the eventual spatial coverage of the site, and paused to scan for birds. Six walkover surveys totalling 8.25 hours were undertaken and a range of weather conditions sampled, although wind speeds of over Beaufort Force 5 were avoided to improve aural detection of species (Table 7).

4.26 For *Target A* species the time each individual was first detected was recorded along with details of age, sex and behaviour (if possible). These details were cross-referenced to a map where the location and flight route (if applicable) were plotted. For all other species the number of individuals was recorded and locations where they were first detected plotted on the map.

Table 7 - Details of Survey Effort and Weather for Winter Walkovers During 2014/2015

Weather = (Cloud 10ths, Cloud base, Wind Direction, Wind Force, Precipitation code*, visibility (km)) * Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog)

Date	Obs	Start	Finish	Duration	Weather
31/10/2014	JAC	1130	1330	2.00	8,800,SW,4,nil,10
15/12/2014	JAC	0915	1100	1.75	4,1200,W,2,nil,10
15/12/2014	JAC	1400	1515	1.25	4,1200,W,2,nil,10

Date	Obs	Start	Finish	Duration	Weather
24/01/2015	JAC	1000	1130	1.50	8,800,W,5,IHS,10
18/03/2015	JAC	1345	1445	1.00	6,800,SW,2,nil,10
19/03/2015	JAC	0930	1015	0.75	10,800,SW,3,nil,10

5. Field Survey Results

Wildfowl

Occurrence and Status

5.1 Greylag goose (*Anser anser*) and pink-footed goose (*Anser brachyrhynchus*) were recorded. Both are regular winter migratory species and as such are afforded protection under the Birds Directive. Greylag goose is listed in Schedule 1 Part 2 of the WCA (for Outer Hebrides, Caithness, Sutherland and Wester Ross only), therefore whilst greylag geese were present within the survey boundary for the proposed main access route during the breeding season and were presumed to have at least attempted breeding, they are not considered to be part of the Schedule 1 listed population.

Abundance and Distribution

5.2 During all surveys 21 flights of pink-footed goose were recorded (Table 8 & 9a-c, Figure 8.4). Two flights in the spring of 2014 (flocks of 2 and 175) passed through the FA, plus eight flights during the spring 2015 migration period involving 562 birds (flocks of between 4 to 155 birds). Three flights of pink-footed goose were recorded within the FA during the autumn of 2014 (flocks of 34, 43 & 48).

5.3 Eight flights of greylag goose were recorded during all surveys (Table 8 & 9a-c, Figure 8.4 & 8.5) with six within the FA. Four flights were recorded during the breeding season of 2014 (flocks of 2, 2, 3 & 6) and two in the breeding season of 2015 (flocks of 2 & 21) passing through the FA. From their behaviour and the dates, all but the flock of 21 were taken to be resident rather than migrating birds.

5.4 Three flights by unidentified flocks of geese were also recorded. Two of which passed through the FA during April 2015 (flocks of 20 & 30).

Flight Activity within a 200 m buffer from GVPs and MWPs – April to August 2014[4]

5.5 Two pink-footed goose flights within the 200 m buffer used for goose collision modelling (CRM) were recorded from GVPs. They involved 177 birds and all had some duration at heights within the potential risk height bands of the turbines

[4] Note this period did not include extra migration period watch effort.

(RHB [5]). Four greylag goose flights within the 200 m buffer were recorded from GVPs, involving 13 birds in total (presumed to be local breeding birds) (Figure 8.4, Table 9a).

Flight Activity within a 200 m buffer from GVPs and MWPs – autumn migration period 2014 and winter 2014/2015

5.6 All three pink-footed goose flights (involving 125 birds) which passed through the 200 m buffer were recorded from GVP watches during this period. They were all flying at heights within the potential RHB. (Figure 8.4, Table 9b).

Flight Activity within a 200 m buffer from GVPs and MWPs – spring migration period 2015

5.7 Three pink-footed goose flights within the 200 m buffer were recorded from GVPs, and five during migration period watches (MWPs). They involved 601 birds and all had some duration at heights within the potential RHB. One greylag goose flight (involving 21 birds) passed within 200 m of the turbine locations and occurred at RHB. Finally two flights by unidentified grey geese (50 birds) passed within the 200 m buffer and were within the RHB (Figure 8.4, Table 9c).

Table 8 - Selected species recorded during the GVP surveys of flight activity. The percentage of five minute recording periods in which each species was encountered during watches from all GVPs in April 2014 to August 2015 (the total number of five minute periods was 4188).

Species	Target Species	% of five minute periods
Red grouse		7.93
Kestrel		6.23
Raven		6.09
Buzzard		3.56
Red kite	T	1.58
Curlew		0.93
Hen harrier	T	0.55
Golden plover	T	0.45
Golden eagle	T	0.45
Short-eared owl	T	0.33
Pink-footed goose		0.29

[5] RHB is given by the lower and upper limits of the recorded flight height bands (i.e. 10 m to 150 m) which encompass the heights swept by the rotating turbine blades (i.e. 20.5 m to 125.5 m). Hence the presented amount of time spent flying at RHB is greater than that spent at collision risk height (crudely about 75 % of RHB flight time is at risk of collision).

Species	Target Species	% of five minute periods
Peregrine	T	0.26
Herring gull		0.24
Merlin	T	0.19
Greylag goose		0.19
Snow bunting		0.17
Sparrowhawk		0.14
Fieldfare		0.12
Rough-legged buzzard		0.12
Meadow pipit		0.10
Osprey	T	0.10
Grey heron		0.03
Canada goose		0.03
Redwing		0.03
Birds listed in Annex 1 of the Birds Directive or Schedule 1 of the WCA are shown in **bold**. Red-listed birds of Conservation Concern species are shown in *italic*		

Table 9a - Flight activity and elevation by goose species which occurred at least partly within the 200 m buffer of the proposed turbines (goose CRM) recorded during GVP watches between April and August 2014.

Species	VP	Date	No. Birds	<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
Greylag goose	1	17/06/14	6		~	~	~		
	2	17/04/14	2	~					
		17/06/14	2				~		
		28/07/14	3			~			
Pink-footed goose	1	16/04/14	175						~
	3	30/05/14	2				~	~	

Table 9b - Flight activity and elevation by goose species which occurred at least partly within the 200 m buffer of the proposed turbines (goose CRM) recorded during GVP and MWP watches between September and December 2015.

Species	VP	Date	No. Birds	<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
Pink-footed goose	1	05/12/14	43					~	
	3	26/09/14	34	~	~	~	~		
		11/11/14	48			~	~		

Table 9c - Flight activity and elevation by goose species which occurred at least partly within the 200 m buffer of the proposed turbines (goose CRM) recorded during GVP and MWP watches between January and August 2015.

Species	VP	Date	No. Birds	<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
Unidentified grey goose species	1	08/04/15	30				~	~	
	2	07/04/15	20				~	~	
Greylag goose	B	05/04/15	21				~	~	~
Pink-footed goose	2	07/04/15	43			~			
	3	16/04/15	100					~	~
		16/04/15	25					~	~
	B	05/04/15	75			~	~	~	
		05/04/15	60			~	~	~	
		07/04/15	23					~	~
		08/04/15	155					~	~
		08/04/15	120					~	~

Raptors and Owls

Occurrence and Status

5.8 Sightings of red kite (*Milvus milvus*), hen harrier, golden eagle, osprey (*Pandion haliaetus*), merlin, peregrine and short-eared owl were recorded. All these species are listed on Annex 1 of the Birds Directive and all but short-eared owl are also listed on Schedule 1 of the WCA. Hen harrier is a Red-listed BoCC. A rough-legged buzzard (*Buteo lagopus*) was seen once during the winter 2014 with all but one flight seen on one day in early December with the final one seen

on the day after. This bird was presumably a single vagrant bird as this species is an unusual passage migrant occurring in Scotland as a vagrant and mostly seen during autumn. Birds from its European breeding range, from Norway to Siberia, winter from France east through central Europe (Forrester *et al* 2007). As this is a single record of a vagrant bird this species will not be included in any further discussion.

Abundance and Distribution

5.9 During the 2014 breeding season observations indicated that merlin probably attempted to breed within the survey boundary, although no nests were located despite watches over suitable areas. The merlin showed agitated behaviour approximately 1.4 km from the nearest turbine location. A short-eared owl roost location was found 1.7 km from a turbine location after the 2014 breeding season, and some foraging activity was recorded in 2014 at a time when breeding activity was probably over (see later, Table 10a). Although Hardey *et al* (2009) consider that observations of foraging activity may constitute "*possible*" breeding, the nature of the 2014 records is not consistent with a possible breeding attempt. A peregrine roost site (just over 2 km from the turbine locations) was found including prey remains and droppings, and feathers of juvenile peregrine (Appendix 8.2 Confidential Annex).

5.10 In 2015, merlin was proven to breed within the 2 km buffer of the turbines (over 1 km from a turbine location). No other raptor or owl species were found to be breeding in 2015.

5.11 During all surveys red kite was recorded on 57 occasions involving 59 birds. Red kite was seen in most months of the year; however, the majority of the flights were observed during the summer (May to August). Of these, 30 flights involving 32 birds were within the FA. Hen harriers were recorded on 24 occasions during all surveys in most months of the year. Of these, 11 flights were within the FA. A male was seen in April 2014 and in May and June 2015, a female in May, July October and November 2014 and January and April 2015, and a juvenile in August and November 2014. Thirty seven flights of golden eagle involving 38 individuals were recorded in April to June 2014 and January February, March, May and June 2015 (all but two records where birds could be aged (30 of 32) were immatures or sub-adults). Twelve flights were within the FA. Eight osprey flights were recorded in May 2014, May, June and July 2015 with one flight of three birds (an adult and two juveniles) in August 2015. One flight was within the FA. Forty one merlin flights were seen, all but two recorded during April, May, June July & August with only two within the FA. Twenty three flights of peregrine were recorded, with a record during most months of the year and six occurred within the FA. Sixteen flights of short-eared owl were recorded during all surveys, during June, July and August 2014 only; eight were within the FA (Tables 8 & 10. Figures 8.5, 8.6 & 8.7).

Flight Activity from GVPs – Breeding Season 2014

Red kite

5.12 Eighteen red kite flights were recorded within the FA, involving 20 birds (two flights involved two birds) for a duration of 43.8 minutes, including 34 minutes in the RHB of the proposed turbines (Table 10a, Figure 8.6).

Hen harrier

5.13 Five hen harrier flights were recorded within the FA for 8.5 minutes. Of this duration 3.2 minutes was within the RHB (Table 10a, Figure 8.6).

Golden Eagle

5.14 During flight activity surveys five golden eagle flights were recorded within the FA for a total duration of 3.0 minutes of which 1.9 minutes were within the height bands encompassing the RHB of the proposed turbines (Table 10a, Figure 8.6).

Peregrine

5.15 Two flights by peregrine were within the FA for 1.9 minutes; 65 seconds were within the proposed RHB (Table 10a, Figure 8.6).

Short-eared owl

5.16 Eight flights by short-eared owl were recorded within the FA. Of the 5.9 minutes recorded, 61 seconds were within the RHB of the proposed turbines (Table 10a, Figure 8.6).

Flight Activity from GVPs – Non-Breeding Season 2014/2105

Hen harrier

5.17 Five hen harrier flights were recorded within the FA for 4.6 minutes. Of this duration 1.6 minutes was at RHB (Table 10b, Figure 8.7).

Merlin

5.18 One merlin flight was recorded within the FA for a total duration of 17 seconds. No flight time was recorded within the height bands encompassing the RHB of the proposed turbines (Table 10b, Figure 8.7).

Peregrine

5.19 Three flights by peregrine were within the FA for 1.3 minutes, of which 63 seconds were within the proposed RHB (Table 10b, Figure 8.7).

Flight Activity from GVPs – Breeding Season 2015

Red kite

5.20 Eleven red kite flights involving 11 birds for 23.2 minutes duration was recorded within the FA and 21.6 minutes of that was in height bands of the RHB of the proposed turbines (Table 10c, Figure 8.6).

Hen harrier

5.21 One hen harrier flight was recorded within the FA for 95 seconds. Of this duration 61 seconds was at RHB (Table 10c, Figure 8.6).

Golden Eagle

5.22 Seven golden eagle flights were recorded within the FA for a total duration of 5.5 minutes of which 4.2 minutes were within the height bands encompassing the RHB of the proposed turbines (Table 10c, Figure 8.6).

Peregrine

5.23 One flight by peregrine was within the FA for 38 seconds, of which 19 seconds were within the proposed RHB (Table 10c, Figure 8.6).

Merlin

5.24 One flight by merlin was recorded within the FA. All of the 22 seconds recorded were within the RHB of the proposed turbines (Table 10c, Figure 8.6).

Osprey

5.25 One flight by osprey was recorded within the FA. All of the 78 seconds recorded were within the RHB of the proposed turbines (Table 10c, Figure 8.6).

Table 10a - Summary of raptor flight activity duration and elevation which occurred within the 500 m buffer of the proposed turbines (FA) recorded from GVP watches between April and August 2014. Data are multiplied by the number of birds involved in each flight where necessary.

Species	GVP	Date	ID	No. Birds	Flying duration (s)	Duration in height bands (s)					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
Red kite	2	12/05/14	1	1	96	15	81				
		20/05/14	1	1	8			8			
			2	1	52	10		42			
			5	1	200	32	168				
			6	1	94	44	50				
		24/06/14	1	1	7			7			
			4	1	37		37				
			5	1	183		76	107			
	Total	**8**		**8**	**677**	**101**	**412**	**164**			
	3	06/05/14	1	1	276	30	152	30	64		
		16/06/14	1	1	146		48	48	50		
		15/07/14	1	1	291		169	122			
		22/07/14	2	1	610	381	198	31			
			3	1	4	4					

Species	GVP	Date	ID	No. Birds	Flying duration (s)	Duration in height bands (s)					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
			4	1	101	34	67				
		23/07/14	2	2	110		37	73			
			3	2	124		33	91			
		14/08/14	1	1	18		18				
		15/18/14	1	1	158	32	63	63			
			1	1	111		110	1			
	Total	**11**		**13**	**1949**	**481**	**895**	**459**	**114**		
KT Total		**19**		**21**	**2626**	**582**	**1307**	**623**	**114**		
Hen harrier	1	28/05/14	1	1	20	4	16				
		14/08/14	1	1	176		16	48	112		
	Total	**2**		**2**	**196**	**4**	**32**	**48**	**112**		
	3	28/04/14	2	1	46	46					
		15/08/14	2	1	91	91					
			3	1	177	177					
	Total	**3**		**3**	**314**	**314**					
HH Total		**5**		**5**	**510**	**318**	**32**	**48**	**112**		

Species	GVP	Date	ID	No. Birds	Flying duration (s)	Duration in height bands (s)					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
Golden eagle	2	20/05/14	3	1	6	6					
			4	1	47	47					
	Total	**2**		**2**	**53**	**53**					
	3	28/04/14	1	1	46			31	15		
		23/06/14	1	1	76	15	46	15			
			2	1	4		4				
	Total	**3**		**3**	**126**	**15**	**50**	**46**	**15**		
EA Total		**5**		**5**	**179**	**68**	**50**	**46**	**15**		
Peregrine	2	22/07/14	1	1	50		16	34			
	Total	**1**		**1**	**50**		**16**	**34**			
	3	19/08/14	1	1	63	47	16				
	Total	**1**		**1**	**63**	**47**	**16**				
PE Total		**2**		**2**	**113**	**47**	**32**	**34**			
Short-eared owl	1	23/07/14	1	1	243	182	61				
		15/08/14	1	1	56	56					
	Total	**2**		**2**	**299**	**238**	**61**				

Species	GVP	Date	ID	No. Birds	Flying duration (s)	Duration in height bands (s)					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
	2	22/07/14	2	1	2	2					
			3	1	5	5					
			4	1	3	3					
			5	1	17	17					
		28/07/14	1	1	24	24					
		14/08/14	2	1	5	5					
	Total	**6**		**6**	**56**	**56**					
SE Total		**8**		**8**	**355**	**294**	**61**				

Table 10b - Summary of raptor flight activity duration and elevation which occurred within the 500 m buffer of the proposed turbines (FA) recorded from GVP watches between September 2014 and March 2015. Data are multiplied by the number of birds involved in each flight where necessary.

Species	GVP	Date	ID	No. Birds	Flying duration (s)	Duration in height bands (s)					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
Hen harrier	1	20/10/14	1	1	10		10				
	Total	**1**		**1**	**10**		**10**				
	2	24/11/14	1	1	63	63					

Species	GVP	Date	ID	No. Birds	Flying duration (s)	Duration in height bands (s)					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
	Total	**1**		**1**	**63**	**63**					
	3	13/11/14	1	1	99	57	42				
			2	1	43	17	26				
		04/12/14	1	1	62	46	16				
	Total	**4**		**4**	**204**	**120**	**84**				
HH Total		**5**		**5**	**277**	**183**	**94**				
Merlin	3	13/10/14	2	1	17	17					
	Total	**1**		**1**	**17**	**17**					
ML Total		**1**		**1**	**17**	**17**					
Peregrine	1	18/12/14	2	1	26		26				
	Total	**1**		**1**	**26**		**26**				
	3	24/09/14	1	1	37		37				
		13/10/14	1	1	13	13					
	Total	**2**		**2**	**50**	**13**	**37**				
PE Total		**3**		**3**	**76**	**13**	**63**				

Table 10c - Summary of raptor flight activity duration and elevation which occurred within the 500 m buffer of the proposed turbines (FA) recorded from GVP watches between April and August 2015. Data are multiplied by the number of birds involved in each flight where necessary.

Species	GVP	Date	ID	No. Birds	Flying duration (s)	Duration in height bands (s)					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
Red Kite	1	17/06/15	1	1	98		15	83			
			2	1	146		48	98			
	Total	**2**		**2**	**244**		**63**	**181**			
	2	17/06/15	1	1	71		60	11			
		24/07/15	1	1	2				2		
			2	1	31						31
	Total	**3**		**3**	**104**		**60**	**11**	**2**		**31**
	3	18/05/15	1	1	105		31	74			
			4	1	219			46	173		
		06/08/15	1	1	127	32	95				
			2	1	415	30	325	60			
			3	1	54			54			
			4	1	124			124			
	Total	**11**		**11**	**1044**	**62**	**451**	**358**	**173**		
KT Total		**3**		**3**	**1392**	**62**	**574**	**550**	**175**	**0**	**31**

Species	GVP	Date	ID	No. Birds	Flying duration (s)	Duration in height bands (s)					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
Hen harrier	1	18/05/15	3	1	95	34	61				
	Total	**1**		**1**	**95**	**34**	**61**				
HH Total		**1**		**1**	**95**	**34**	**61**				
Golden eagle	1	18/05/15	1	1	40	13	11	16			
			2	1	43	15	20	8			
			4	1	32		1	31			
		16/06/15	6	1	32	16	16				
	Total	**4**		**4**	**147**	**44**	**48**	**55**			
	2	18/05/15	1	1	45	15	30				
			2	1	15	15					
	Total	**2**		**2**	**60**	**30**	**30**				
	3	11/05/15	1	1	120		56	47	17		
	Total	**1**	**1**	**1**	**120**		**56**	**47**	**17**		
EA Total		**7**		**7**	**327**	**74**	**134**	**102**	**17**		
Merlin	2	08/04/15	2	1	22		22				
	Total	**1**		**1**	**22**		**22**				

Species	GVP	Date	ID	No. Birds	Flying duration (s)	Duration in height bands (s)					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
ML Total		**1**		**1**	**22**		**22**				
Peregrine	3	05/04/15	1	1	38	19	19				
	Total	**1**		**1**	**38**	**19**	**19**				
PE Total		**1**		**1**	**38**	**19**	**19**				
Osprey	1	29/06/15	1	1	78			35	43		
	Total	**1**		**1**	**78**			**35**	**43**		
OP Total		**1**		**1**	**78**			**35**	**43**		

Black grouse

Occurrence and Status and Distribution

5.26 This species was found within surveys of the buffer of the access route and the borrow pit A location. It is a Red listed BoCC.

5.27 During the two visits in spring of 2015 of this area a lek of 12 males was located. Checks of the area marked as a black grouse lek location within the existing estate Habitat Management Plan found no signs of activity (Table 5 and Figure 8.8).

Waders

Occurrence and Status

5.28 Eight species of wader were recorded during all surveys: oystercatcher (*Haematopus ostralegus*), golden plover (*Pluvialis apricaria*), lapwing (*Vanellus vanellus*), dunlin (*Calidris alpina*), snipe (*Gallinago gallinago*), curlew (*Numenius arquata*), common sandpiper (*Actitis hypoleucos*) and redshank (*Tringa totanus*) (Table 11a & b, 12, 13 & 14, Figure 8.9, 8.10 & 8.11).

5.29 Of these, golden plover and dunlin are listed on Annex 1 of the Birds Directive. Lapwing and dunlin are Red listed BoCC, whilst curlew is classified as near threatened by the International Union for the Conservation of Nature (IUCN).

Abundance and Distribution

5.30 All these species were found within the 500 m survey buffers of the proposed turbine locations or the proposed main access route but not all were breeding (Table 12, 13 & 14, Figure 8.10 & 8.11).

Golden plover

5.31 Golden plover were recorded in the breeding season and seven breeding territories were confirmed during the 2014 surveys within the 500 m buffer of the proposed turbines, while four were confirmed within this area during 2015 (Table 12, Figure 8.10 & 8.11). In 2014, 15 separate territories were confirmed along with four possible territories within the 500 m buffer of the proposed main access route (Table 13, Figure 8.10). Eight flights were recorded from all GVP watches within the FA, five in July 2014 of one, three or seven birds plus one flight in March of 2015 of two birds, and one in July and August 2015 of one and seven birds respectively (Table 11a, Figure 8.9). Golden plover were recorded during the winter walkover surveys with two juvenile birds seen in October and three adults in mid-March.

Lapwing

5.32 Two confirmed and one probable territories were identified within the 500 m buffer of the proposed main access route (Table 13, Figure 8.10).

Dunlin

5.33 One bird was heard calling in flight during April only. No breeding birds were found in either of the survey buffers.

Curlew

5.34 Only one probable curlew territory was identified within the 500 m buffer of the proposed turbines in 2014 whilst in 2015 three territory centres were confirmed within this buffer (Table 12, Figure 8.10 & 8.11). Eighteen confirmed, one probable and three possible territories were identified during the 2014 surveys of the 500 m buffer of the proposed main access route (Table 13, Figure 8.10). Twenty flights were recorded from GVP watches within the FA, five in June 2014 of one, three and four birds and one in July 2014 of one bird, plus three in April 2015 (of one and three birds) nine in May (mainly of single individuals but with two flights of two birds) and two in June 2015 (Table 11a & b, Figure 8.9). A pair and a single curlew were recorded once during walkovers in March 2015, presumably birds returning to breed.

Other wader species

5.35 The territories of three other species of waders were identified within the 500 m buffer of the proposed main access route. Common sandpiper and snipe both had one confirmed and one probable territory whilst oystercatcher had one confirmed. Two redshanks were flushed on one occasion during May but showed no territorial behaviour (Table 13, Figure 8.10).

Flight Activity from GVPs – Breeding Season 2014 and 2015

5.36 Golden plover and curlew was classified as *Target B* species for flight activity recording. Therefore flight lines were mapped and height bands were recorded but flights were not timed. To enable collision risk modelling to be completed, the durations of the flights were calculated by applying a speed for each species derived from published studies (Alerstam *et al* 2007) to the mapped length of the flight to derive its duration. This duration was then proportioned equally amongst the flight bands recorded for the flight and this was used to produce durations at risk height for all flights mapped from each GVP for both species. These data are presented in Tables 11a and 11b.

Golden plover

5.37 Eight flights were recorded from all GVP watches within the FA involving 29 birds, mainly using height bands within the lower levels of the RHB of the proposed turbines (30 m -50 m and below) (Table 11a & b, Figure 8.9).

Curlew

5.38 Twenty flights were recorded from GVP watches within the FA involving 32 birds, with flights ranging between below the RHB and those within the RHB (Table 11a & b, Figure 8.9).

Table 11a - Flight activity and elevation by wader species which occurred at least partly within the 500 m buffer of the proposed turbines (FA) recorded during GVP watches between April and August 2014. Durations calculated based on mapped flight length and published flight speeds.

Species	GVP	Date	ID	No. Birds	Calculated Duration (s) (multiplied by flock size)	Duration calculated for each height band (s) for total birds in each flight					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
Golden plover	2	18/07/14	2	1	54		54				
	Total	**1**		**1**	**54**		**54**				
	3	15/07/14	2	1	30		30				
		22/07/14	1	7	31(217)	108	109				
			2	7	127 (889)	222	222	223	222		
		23/07/14	4	3	13 (39)	39					
	Total	**4**		**18**	**201 (1145)**	**369**	**361**	**222**	**222**		
GP Total				**19**	**255 (1229)**	**369**	**415**	**223**	**222**		
Curlew	1	23/06/14	4	3	89 (267)		133	134			
			3	1	60	30	30				
			4	1	138	46	46	46			
	Total	**3**		**5**	**287 (465)**	**76**	**209**	**180**			
	2	24/06/14	2	4	45 (180)			180			

Species	GVP	Date	ID	No. Birds	Calculated Duration (s) (multiplied by flock size)	Duration calculated for each height band (s) for total birds in each flight					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
			3	4	58 (232)			232			
	Total	**2**		**8**	**103 (412)**			**412**			
	3	22/07/14	1	1	22	22					
	Total	**1**		**1**	**22**	**22**					
CU Total				**14**	**412 (899)**	**98**	**209**	**592**			

Table 11b - Flight activity and elevation by wader species which occurred at least partly within the 500 m buffer of the proposed turbines (FA) recorded during GVP watches between mid-March and August 2015. Durations calculated based on mapped flight length and published flight speeds.

Species	GVP	Date	ID	No. Birds	Calculated Duration (s) (multiplied by flock size)	Duration calculated for each height band (s) for total birds in each flight					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
Golden plover	2	19/03/15	1	2	25 (50)		25	25			
	Total	**1**		**2**	**25 (50)**		**25**	**25**			
	3	27/07/15	1	1	9	9					
		06/08/15	5	7	23 (161)	161					
	Total	**2**		**8**	**32 (170)**	**170**					

Species	GVP	Date	ID	No. Birds	Calculated Duration (s) (multiplied by flock size)	Duration calculated for each height band (s) for total birds in each flight					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
GP Total				**10**	**57 (220)**	**170**	**25**	**25**			
Curlew	1	08/04/15	1	1	133		66	67			
		28/04/15	1	3	170 (510)	170	170	170			
		15/05/15	1	1	115		38	39	38		
	Total	**3**		**5**	**418 (758)**	**170**	**274**	**276**	**38**		
	2	08/04/15	3	1	88			44	44		
		20/05/15	1	1	40		20	20			
	Total	**2**		**2**	**128**		**20**	**64**	**44**		
	3	01/05/15	1	1	144	48	48	48			
			2	1	29	14	15				
			3	1	101	25	25	26	25		
		18/05/15	2	1	43		21	22			
			5	2	47 (94)		47	47			
			6	2	16 (32)		32				
			7	1	49	24	25				

Species	GVP	Date	ID	No. Birds	Calculated Duration (s) (multiplied by flock size)	Duration calculated for each height band (s) for total birds in each flight					
						<10 m	10-30 m	30-50 m	50-100 m	100-150 m	>150 m
		11/06/15	1	1	106			53	53		
			1	1	9	9					
	Total	**9**		**11**	**544 (607)**	**120**	**213**	**196**	**78**		
CU Total				**18**	**1090 (1493)**	**290**	**507**	**536**	**160**		

Table 12 - Territory abundance of selected species recorded during breeding bird surveys within the 500 m buffer of the proposed turbines in 2014

Species	**Count of territories**	
	Confirmed	**Probable**
Red grouse	24	
Golden plover	7	
Curlew		1
Birds listed in Annex 1 of the Birds Directive or Schedule 1 of the WCA are shown in bold. Red-listed birds of Conservation Concern species are shown in italic.		

Table 13 - Territory abundance of selected species recorded during breeding bird surveys within the 500 m buffer of the proposed main access route in 2014

Species	**Count of territories**		
	Confirmed	**Probable**	**Possible**
Red grouse	80		
Curlew	18	1	3
Golden plover	14		4
Lapwing	2	1	
Common sandpiper	1	1	
Snipe	1	1	
Kestrel	1		
Oystercatcher	1		
Sand martin	Colony (c 50 adults)		
Common gull	Colony (c 32 adults)		
Birds listed in Annex 1 of the Birds Directive or Schedule 1 of the WCA are shown in bold. Red-listed birds of Conservation Concern are shown in italic.			

Table 14 - Territory abundance of wader species recorded during breeding bird surveys within the 500 m buffer of the proposed turbines in 2015

Species	Count of territories	
	Confirmed	**Probable**
Golden plover	4	
Curlew	3	
Birds listed in Annex 1 of the Birds Directive or Schedule 1 of the WCA are shown in bold. Red-listed birds of Conservation Concern species are shown in italic.		

Other Species of Interest

Red grouse

5.39 Red grouse (*Lagopus lagopus scotica*) were present all year. As expected for a moor managed for red grouse, they were abundant during the breeding bird surveys. There were 24 territories identified within 500 m of the proposed turbines in 2014 (Table 12) and a further 80 territories identified along the 500 m buffer of the proposed main access route in 2014 (Table 13). A good number of broods were located during the later survey visits in 2014. In the winter groups of 30 and 25 were flushed during walk-over surveys.

Common gull

5.40 Common gulls (*Larus canus*) were noted in a large colony beyond the survey boundaries for the proposed main access route. A small colony of approximately 32 adults was also identified within the 500 m buffer of the proposed main access route in 2014 (Table 13, Figure 8.10). Nest cups were found and birds showed territorial behaviour, however no eggs or chicks were seen.

Sand martin

5.41 A colony of breeding sand martins (*Riparia riparia*) was identified on the river bank within the 500 m buffer of the proposed main access route in 2014. There were approximately 45 holes in the colony, and approximately 50 adult birds were recording using some of these holes (Table 13, Figure 8.10).

Raven, Kestrel and Buzzard

5.42 These species were recorded most often during the GVP watches. One kestrel nest was located during the breeding bird survey of the main access route in 2014 and one in 2015 during other surveys (Table 8 & 13, Figure 8.10).

6. References

Alerstam, T., Rosen, M., Backman, J., Ericson, P.G.P. & Hellgren, O. (2007). Flight speeds among bird species: Allometric and phylogenetic effects. *PLoS Biol* 5 (8): e197. Doi:10.1371/journal.pbio.0050197.

Band, W., Madders, M. & Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at wind farms. In de Lucas, M, Janss, G. and Ferrer, M. (eds) *Birds and Wind Power*. Lynx Edicions, Barcelona.

Brown, A.F. and Shepherd, K.B. (1993). A method for censusing upland breeding waders. *Bird study* 40: 3 pp189-195.

Cawdor Estate (2012). *SRDP Rural Priorities Moorland & Muirburn Management Plan*.

Eaton, M.A., Brown, A.F., Noble, D.G., Musgrove A.J., Hearn, R., Aebischer, N.J., Gibbons, D.W., Evans, A. and Gregory, R.D. (2009). Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. *British Birds* 102: 296-341.

Forrester, R.W., Andrews, I.J., McInerny, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C. & Grundy, D.S. (eds) (2007). The Birds of Scotland. The Scottish Ornithologists' Club, Aberlady.

Gilbert, G., Gibbons, D.W. and Evans, J. (1998). *Bird monitoring methods*. RSPB Sandy, Bedfordshire.

Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. and Thompson, D. (2009*). Raptors, a field guide to survey and monitoring*. The Stationery Office, Edinburgh.

Infinergy (June 2009). *Tom nan Clach Wind Farm Environmental Statement*.

Infinergy (August 2009). *Tom nan Clach Wind Farm Environmental Statement Addendum 1*.

Annex 1.1 - Recording Periods used in Diurnal Stratification of Watches

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Early GVPs finish/ Middle GVPs begin	09:30	09:00	08:30**	08:30	07:45	07:30	08:00	08:30	09:00	09:30*	09:00	09:30
Middle GVPs finish/Late GVPs begin	15:00	16:00	16:30**	18:00	19:00	19:00	19:00	18:30	17:30	16:30*	15:00	14:30
	GMT	GMT	GMT	BST	BST	BST	BST	BST	BST	BST	GMT	GMT

* This time is BST. When clocks changed time was kept in line with this, within month.

** This time is GMT. When clocks changed time was kept in line with this, within month.

Annex 1.2 - Generic Vantage Point Survey Information

***Watch ID relates to Annex 1.3 Weather Details**

Date	Obs	GVP	Start	End	Duration	Watch ID*
08/04/2014	FL	2	1220	1420	2.00	TNCX_140408_001
08/04/2014	JAC	1	1315	1615	3.00	TNCX_140408_003
16/04/2014	JAC	1	0715	0845	1.50	TNCX_140416_001
16/04/2014	JAC	1	0845	1015	1.50	TNCX_140416_002
16/04/2014	SJP	2	0700	0830	1.50	TNCX_140416_003
16/04/2014	SJP	2	0830	1000	1.50	TNCX_140416_004
17/04/2014	JAC	1	1805	1935	1.50	TNCX_140417_001
17/04/2014	FL	2	1700	1800	1.00	TNCX_140417_002
17/04/2014	FL	2	1800	1930	1.50	TNCX_140417_003
22/04/2014	JAC	3	1300	1430	1.50	TNCX_140422_001
28/04/2014	JAC	3	1630	1800	1.50	TNCX_140428_001
28/04/2014	JAC	3	1800	1930	1.50	TNCX_140428_002
29/04/2014	JAC	3	0700	0830	1.50	TNCX_140429_001
05/05/2014	JAC	3	1730	1900	1.50	TNCX_140505_001
05/05/2014	JAC	3	1900	2030	1.50	TNCX_140505_002
06/05/2014	JAC	3	1000	1300	3.00	TNCX_140506_001
12/05/2014	JAC	1	1530	1630	1.00	TNCX_140512_001
12/05/2014	JAC	2	1730	1900	1.50	TNCX_140512_002
12/05/2014	JAC	2	1900	2030	1.50	TNCX_140512_003
13/05/2014	JAC	1	1315	1545	2.50	TNCX_140513_001
13/05/2014	JAC	2	0600	0730	1.50	TNCX_140513_002
13/05/2014	JAC	2	0745	0915	1.50	TNCX_140513_003
20/05/2014	JAC	1	0615	0745	1.50	TNCX_140520_001
20/05/2014	JAC	1	0745	0915	1.50	TNCX_140520_002
20/05/2014	JAC	2	1530	1730	2.00	TNCX_140520_003
28/05/2014	JAC	1	1900	2030	1.50	TNCX_140528_001

Date	Obs	GVP	Start	End	Duration	Watch ID*
30/05/2014	JAC	3	0615	0745	1.50	TNCX_140530_001
30/05/2014	JAC	3	0745	0815	0.50	TNCX_140530_002
16/06/2014	JAC	3	1530	1700	1.50	TNCX_140616_001
16/06/2014	JAC	3	1900	2030	1.50	TNCX_140616_002
17/06/2014	JAC	1	0600	0730	1.50	TNCX_140617_003
17/06/2014	JAC	1	0730	0900	1.50	TNCX_140617_004
17/06/2014	JAC	2	1340	1510	1.50	TNCX_140617_005
17/06/2014	JAC	2	1900	2030	1.50	TNCX_140617_006
19/06/2014	JAC	1	1130	1400	2.50	TNCX_140619_003
20/06/2014	JAC	2	0600	0730	1.50	TNCX_140620_003
20/06/2014	JAC	2	0730	0900	1.50	TNCX_140620_004
23/06/2014	JAC	1	1730	1900	1.50	TNCX_140623_001
23/06/2014	JAC	1	1900	2030	1.50	TNCX_140623_002
23/06/2014	JAC	3	0600	0730	1.50	TNCX_140623_003
23/06/2014	JAC	3	0730	0900	1.50	TNCX_140623_004
24/06/2014	JAC	2	1330	1530	2.00	TNCX_140624_001
30/06/2014	JAC	3	1115	1315	2.00	TNCX_140630_001
07/07/2014	JAC	1	1315	1515	2.00	TNCX_140707_001
08/07/2014	JAC	1	0630	0800	1.50	TNCX_140708_001
15/07/2014	JAC	3	1630	1800	1.50	TNCX_140715_001
15/07/2014	JAC	3	1930	2100	1.50	TNCX_140715_002
18/07/2014	JAC	1	1440	1610	1.50	TNCX_140718_001
18/07/2014	JAC	2	0630	0800	1.50	TNCX_140718_002
18/07/2014	JAC	2	0800	0930	1.50	TNCX_140718_003
22/07/2014	JAC	2	1500	1630	1.50	TNCX_140722_001
22/07/2014	JAC	2	1945	2115	1.50	TNCX_140722_002
22/07/2014	JAC	3	0630	0800	1.50	TNCX_140722_003

Date	Obs	GVP	Start	End	Duration	Watch ID*
22/07/2014	JAC	3	0800	0930	1.50	TNCX_140722_004
23/07/2014	JAC	1	1730	1900	1.50	TNCX_140723_001
23/07/2014	JAC	1	1900	2030	1.50	TNCX_140723_002
23/07/2014	JAC	3	1220	1420	2.00	TNCX_140723_003
28/07/2014	JAC	2	1630	1830	2.00	TNCX_140728_001
14/08/2014	JAC	1	0630	0800	1.50	TNCX_140814_001
14/08/2014	JAC	1	1500	1630	1.50	TNCX_140814_002
14/08/2014	JAC	2	1700	1830	1.50	TNCX_140814_003
14/08/2014	JAC	2	1830	2000	1.50	TNCX_140814_004
14/08/2014	JAC	3	1050	1350	3.00	TNCX_140814_006
15/08/2014	JAC	1	1430	1600	1.50	TNCX_140815_001
15/08/2014	JAC	1	1830	2000	1.50	TNCX_140815_002
15/08/2014	JAC	3	0700	0830	1.50	TNCX_140815_003
15/08/2014	JAC	3	0830	1000	1.50	TNCX_140815_004
15/08/2014	JAC	2	1630	1800	1.50	TNCX_140815_006
19/08/2014	JAC	1	1045	1215	1.50	TNCX_140819_001
19/08/2014	JAC	2	0645	0815	1.50	TNCX_140819_002
19/08/2014	JAC	2	0830	1000	1.50	TNCX_140819_003
19/08/2014	JAC	3	1900	2030	1.50	TNCX_140819_004
24/09/2014	JAC	1	0715	0845	1.50	TNCX_140924_001
24/09/2014	JAC	2	1630	1730	1.00	TNCX_140924_002
24/09/2014	JAC	2	1730	1900	1.50	TNCX_140924_003
24/09/2014	JAC	3	1230	1530	3.00	TNCX_140924_004
25/09/2014	JAC	1	1100	1400	3.00	TNCX_140925_001
25/09/2014	JAC	2	0730	0900	1.50	TNCX_140925_002
25/09/2014	JAC	2	0900	1030	1.50	TNCX_140925_003
25/09/2014	JAC	3	1700	1730	0.50	TNCX_140925_004

Date	Obs	GVP	Start	End	Duration	Watch ID*
25/09/2014	JAC	3	1730	1900	1.50	TNCX_140925_005
26/09/2014	JAC	1	1600	1730	1.50	TNCX_140926_001
26/09/2014	JAC	1	1730	1900	1.50	TNCX_140926_002
26/09/2014	JAC	2	1430	1530	1.00	TNCX_140926_003
26/09/2014	JAC	3	0730	0900	1.50	TNCX_140926_004
26/09/2014	JAC	3	0900	1000	1.00	TNCX_140926_005
07/10/2014	JAC	1	0815	0915	1.00	TNCX_141007_001
07/10/2014	JAC	1	1330	1500	1.50	TNCX_141007_002
07/10/2014	JAC	2	1530	1630	1.00	TNCX_141007_003
07/10/2014	JAC	2	1630	1730	1.00	TNCX_141007_004
10/10/2014	JAC	2	0730	0830	1.00	TNCX_141010_001
13/10/2014	JAC	3	0830	0930	1.00	TNCX_141013_001
13/10/2014	JAC	3	0930	1130	2.00	TNCX_141013_002
20/10/2014	JAC	1	1530	1630	1.00	TNCX_141020_001
20/10/2014	JAC	1	1630	1730	1.00	TNCX_141020_002
28/10/2014	JAC	2	1130	1330	2.00	TNCX_141028_001
30/10/2014	JAC	3	1400	1530	1.50	TNCX_141030_002
30/10/2014	JAC	3	1530	1630	1.00	TNCX_141030_003
31/10/2014	JAC	1	0940	1040	1.00	TNCX_141031_001
31/10/2014	JAC	2	1400	1530	1.50	TNCX_141031_002
05/11/2014	JAC	1	0750	0850	1.00	TNCX_141105_001
05/11/2014	JAC	1	0900	1030	1.50	TNCX_141105_002
05/11/2014	JAC	2	1500	1600	1.00	TNCX_141105_003
07/11/2014	JAC	2	0800	0900	1.00	TNCX_141107_001
07/11/2014	JAC	2	0900	1000	1.00	TNCX_141107_002
11/11/2014	JAC	3	1330	1500	1.50	TNCX_141111_001
11/11/2014	JAC	3	1500	1600	1.00	TNCX_141111_002

Date	Obs	GVP	Start	End	Duration	Watch ID*
13/11/2014	JAC	3	0800	0900	1.00	TNCX_141113_001
13/11/2014	JAC	3	0900	1030	1.50	TNCX_141113_002
24/11/2014	JAC	2	0945	1145	2.00	TNCX_141124_001
25/11/2014	JAC	1	1330	1500	1.50	TNCX_141125_001
25/11/2014	JAC	1	1500	1600	1.00	TNCX_141125_002
04/12/2014	JAC	2	1330	1430	1.00	TNCX_141204_001
04/12/2014	JAC	2	1430	1530	1.00	TNCX_141204_002
04/12/2014	JAC	3	0830	0930	1.00	TNCX_141204_003
04/12/2014	JAC	3	0930	1100	1.50	TNCX_141204_004
05/12/2014	JAC	1	1330	1430	1.00	TNCX_141205_001
05/12/2014	JAC	1	1430	1530	1.00	TNCX_141205_002
05/12/2014	JAC	2	0830	0930	1.00	TNCX_141205_003
05/12/2014	JAC	2	0930	1100	1.50	TNCX_141205_004
15/12/2014	JAC	3	1100	1300	2.00	TNCX_141215_001
18/12/2014	JAC	1	1100	1330	2.50	TNCX_141218_001
08/01/2015	JAC	1	1300	1500	2.00	TNCX_150108_001
08/01/2015	JAC	1	1500	1600	1.00	TNCX_150108_002
08/01/2015	JAC	2	0830	0930	1.00	TNCX_150108_003
08/01/2015	JAC	2	0930	1130	2.00	TNCX_150108_004
13/01/2015	JAC	3	1300	1500	2.00	TNCX_150113_001
13/01/2015	JAC	3	1500	1600	1.00	TNCX_150113_002
14/01/2015	JAC	3	0830	0930	1.00	TNCX_150114_001
14/01/2015	JAC	3	0930	1030	1.00	TNCX_150114_002
12/02/2015	JAC	1	1100	1400	3.00	TNCX_150212_001
12/02/2015	JAC	1	1430	1600	1.50	TNCX_150212_002
12/02/2015	JAC	1	1600	1700	1.00	TNCX_150212_003
13/02/2015	JAC	1	0800	0900	1.00	TNCX_150213_001

Date	Obs	GVP	Start	End	Duration	Watch ID*
13/02/2015	JAC	1	0900	1000	1.00	TNCX_150213_002
14/02/2015	JAC	3	1000	1300	3.00	TNCX_150214_001
14/02/2015	JAC	3	1600	1700	1.00	TNCX_150214_002
17/02/2015	JAC	3	1300	1430	1.50	TNCX_150217_001
16/03/2015	KJD	2	1600	1630	0.50	TNCX_150316_001
16/03/2015	KJD	2	1630	1800	1.50	TNCX_150316_002
16/03/2015	JAC	3	1630	1800	1.50	TNCX_150316_003
17/03/2015	KJD	2	1530	1630	1.00	TNCX_150317_001
17/03/2015	KJD	2	1630	1800	1.50	TNCX_150317_002
17/03/2015	KJD	3	1125	1425	3.00	TNCX_150317_003
18/03/2015	KJD	1	1055	1355	3.00	TNCX_150318_001
18/03/2015	KJD	2	0700	0830	1.50	TNCX_150318_002
18/03/2015	KJD	2	0830	1000	1.50	TNCX_150318_003
18/03/2015	JAC	3	0700	0830	1.50	TNCX_150318_004
18/03/2015	JAC	3	1245	1345	1.00	TNCX_150318_005
19/03/2015	KJD	2	0700	0800	1.00	TNCX_150319_002
19/03/2015	JAC	1	0700	0830	1.50	TNCX_150319_004
19/03/2015	JAC	1	0830	0930	1.00	TNCX_150319_005
19/03/2015	JAC	2	1015	1215	2.00	TNCX_150319_006
27/03/2015	JAC	1	1630	1800	1.50	TNCX_150327_001
27/03/2015	JAC	2	1330	1530	2.00	TNCX_150327_002
05/04/2015	JAC	3	0700	0830	1.50	TNCX_150405_001
05/04/2015	JAC	3	1230	1400	1.50	TNCX_150405_002
07/04/2015	JAC	2	0700	0830	1.50	TNCX_150407_001
07/04/2015	JAC	2	0830	1000	1.50	TNCX_150407_002
08/04/2015	JAC	1	0700	0830	1.50	TNCX_150408_001
08/04/2015	JAC	1	0830	1000	1.50	TNCX_150408_002

Date	Obs	GVP	Start	End	Duration	Watch ID*
08/04/2015	JAC	2	1630	1800	1.50	TNCX_150408_003
08/04/2015	JAC	2	1800	1930	1.50	TNCX_150408_004
16/04/2015	JAC	3	1700	1800	1.00	TNCX_150416_001
16/04/2015	JAC	3	1800	1930	1.50	TNCX_150416_002
27/04/2015	JAC	1	1035	1335	3.00	TNCX_150427_001
28/04/2015	JAC	1	1800	1930	1.50	TNCX_150428_001
28/04/2015	JAC	2	1200	1330	1.50	TNCX_150428_002
01/05/2015	JAC	3	1100	1300	2.00	TNCX_150501_001
11/05/2015	JAC	3	1730	1900	1.50	TNCX_150511_001
11/05/2015	JAC	3	1900	2030	1.50	TNCX_150511_002
15/05/2015	JAC	1	1030	1330	3.00	TNCX_150515_001
15/05/2015	JAC	2	0615	0745	1.50	TNCX_150515_002
15/05/2015	JAC	2	0745	0915	1.50	TNCX_150515_003
18/05/2015	JAC	1	1430	1630	2.00	TNCX_150518_001
18/05/2015	JAC	2	1730	1900	1.50	TNCX_150518_002
18/05/2015	JAC	2	1900	2030	1.50	TNCX_150518_003
18/05/2015	JAC	3	1030	1300	2.50	TNCX_150518_004
20/05/2015	JAC	1	1900	2030	1.50	TNCX_150520_001
20/05/2015	JAC	2	1630	1830	2.00	TNCX_150520_002
23/05/2015	JAC	3	0615	0745	1.50	TNCX_150523_001
23/05/2015	JAC	3	0745	0845	1.00	TNCX_150523_002
27/05/2015	JAC	1	0615	0745	1.50	TNCX_150527_001
02/06/2015	JAC	3	0600	0730	1.50	TNCX_150602_001
02/06/2015	JAC	3	0730	0900	1.50	TNCX_150602_002
04/06/2015	JAC	2	1730	1900	1.50	TNCX_150604_001
04/06/2015	JAC	2	1900	2030	1.50	TNCX_150604_002
04/06/2015	JAC	3	1300	1500	2.00	TNCX_150604_003

Date	Obs	GVP	Start	End	Duration	Watch ID*
11/06/2015	JAC	3	1730	1900	1.50	TNCX_150611_001
11/06/2015	JAC	3	1900	2030	1.50	TNCX_150611_002
16/06/2015	JAC	1	0600	0730	1.50	TNCX_150616_001
16/06/2015	JAC	1	0730	0900	1.50	TNCX_150616_002
17/06/2015	JAC	1	1110	1310	2.00	TNCX_150617_001
17/06/2015	FL	2	1320	1520	2.00	TNCX_150617_002
29/06/2015	JAC	1	1730	1900	1.50	TNCX_150629_001
29/06/2015	JAC	1	1900	2030	1.50	TNCX_150629_002
29/06/2015	JAC	2	0600	0730	1.50	TNCX_150629_003
29/06/2015	JAC	2	0730	0900	1.50	TNCX_150629_004
09/07/2015	JAC	1	1600	1800	2.00	TNCX_150709_001
23/07/2015	JAC	1	0630	0800	1.50	TNCX_150723_001
23/07/2015	JAC	1	0800	0930	1.50	TNCX_150723_002
23/07/2015	JAC	2	1730	1900	1.50	TNCX_150723_003
23/07/2015	JAC	2	1900	2030	1.50	TNCX_150723_004
23/07/2015	JAC	3	1045	1345	3.00	TNCX_150723_005
24/07/2015	JAC	2	1415	1645	2.50	TNCX_150724_001
24/07/2015	JAC	3	1800	1900	1.00	TNCX_150724_002
24/07/2015	JAC	3	1900	2030	1.50	TNCX_150724_003
27/07/2015	JAC	3	1020	1250	2.50	TNCX_150727_001
30/07/2015	JAC	1	1730	1900	1.50	TNCX_150730_001
30/07/2015	JAC	1	1900	2030	1.50	TNCX_150730_002
30/07/2015	JAC	2	1350	1620	2.50	TNCX_150730_003
04/08/2015	JAC	1	1045	1215	1.50	TNCX_150804_001
04/08/2015	JAC	2	0700	0830	1.50	TNCX_150804_002
04/08/2015	JAC	2	0830	1000	1.50	TNCX_150804_003
04/08/2015	JAC	3	1830	2000	1.50	TNCX_150804_004

Date	Obs	GVP	Start	End	Duration	Watch ID*
06/08/2015	JAC	1	1730	1830	1.00	TNCX_150806_001
06/08/2015	JAC	1	1830	2000	1.50	TNCX_150806_002
06/08/2015	JAC	2	1530	1700	1.50	TNCX_150806_003
06/08/2015	JAC	3	1145	1445	3.00	TNCX_150806_004
07/08/2015	JAC	1	0700	0830	1.50	TNCX_150807_001
07/08/2015	JAC	1	0830	0930	1.00	TNCX_150807_002
07/08/2015	JAC	2	1030	1200	1.50	TNCX_150807_003
10/08/2015	JAC	1	1100	1200	1.00	TNCX_150810_001
10/08/2015	JAC	2	1250	1420	1.50	TNCX_150810_002
11/08/2015	JAC	3	0700	0730	0.50	TNCX_150811_001
11/08/2015	JAC	3	0915	0945	0.50	TNCX_150811_002

Annex 1.3 Weather details for GVP watches

***Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog**

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140408_001	0	5	800	W	6	nil	20
TNCX_140408_001	1	6	800	W	6	nil	20
TNCX_140408_001	2	6	800	W	5	ILR	20
TNCX_140408_003	0	7	1200	W	4	nil	10
TNCX_140408_003	1	8	1200	W	5	ILR	10
TNCX_140408_003	2	7	1200	W	5	nil	10
TNCX_140408_003	3	8	1000	W	4	nil	10
TNCX_140416_001	0	9	800	SW	4	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140416_001	1	9	800	W	4	nil	10
TNCX_140416_001	2	9	800	W	4	nil	10
TNCX_140416_002	0	9	800	W	4	nil	10
TNCX_140416_002	1	10	800	W	4	nil	10
TNCX_140416_002	2	9	800	W	3	nil	10
TNCX_140416_003	0	10	1000	SW	4	nil	10
TNCX_140416_003	1	10	1000	SW	5	nil	10
TNCX_140416_004	0	10	1000	SW	5	nil	10
TNCX_140416_004	1	10	1000	SW	4	nil	10
TNCX_140417_001	0	9	800	NW	5	nil	10
TNCX_140417_001	1	8	800	NW	3	nil	10
TNCX_140417_001	2	9	800	NW	4	nil	10
TNCX_140417_002	0	10	700	NW	5	ILH	5
TNCX_140417_002	1	9	700	NW	4	nil	10
TNCX_140417_003	0	9	700	NW	3	nil	10
TNCX_140417_003	1	8	700	NW	4	nil	10
TNCX_140422_001	0	10	600	E	4	nil	2
TNCX_140422_001	1	10	600	E	4	nil	2

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140428_001	0	2	1200	SE	3	nil	10
TNCX_140428_001	1	2	1200	SE	4	nil	10
TNCX_140428_001	2	2	1200	E	3	nil	10
TNCX_140428_002	0	2	1200	E	3	nil	10
TNCX_140428_002	1	1	1200	E	2	nil	10
TNCX_140428_002	2	2	1200	E	2	nil	10
TNCX_140429_001	0	8	1000	W	2	nil	10
TNCX_140429_001	1	9	1000	W	2	nil	10
TNCX_140429_001	2	10	400	W	2	CHF	1
TNCX_140505_001	0	9	800	SW	5	nil	10
TNCX_140505_001	1	10	800	SW	5	nil	10
TNCX_140505_001	2	10	1000	SW	5	nil	10
TNCX_140505_002	0	10	1000	SW	5	nil	10
TNCX_140505_002	1	9	1000	SW	5	nil	10
TNCX_140505_002	2	8	1000	SW	5	nil	10
TNCX_140506_001	0	9	700	SW	3	nil	10
TNCX_140506_001	1	9	700	SW	4	nil	10
TNCX_140506_001	2	8	800	SW	3	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140506_001	3	7	800	SW	4	nil	10
TNCX_140512_001	0	7	1200	NE	2	nil	10
TNCX_140512_001	1	6	1200	NE	3	nil	10
TNCX_140512_002	0	4	1200	NE	3	nil	10
TNCX_140512_002	1	3	1200	NE	3	nil	10
TNCX_140512_002	2	2	1200	NE	3	nil	10
TNCX_140512_003	0	2	1200	NE	3	nil	10
TNCX_140512_003	1	2	1200	NE	2	nil	10
TNCX_140512_003	2	1	1200	NE	2	nil	10
TNCX_140513_001	0	8	800	W	3	ILR	10
TNCX_140513_001	1	7	800	NW	2	nil	10
TNCX_140513_001	2	7	800	NW	3	nil	10
TNCX_140513_001	3	8	800	NW	3	ILR	
TNCX_140513_002	0	6	1000		0	nil	10
TNCX_140513_002	1	5	1000		0	nil	10
TNCX_140513_002	2	6	800	SW	1	nil	10
TNCX_140513_003	0	7	800	SW	1	nil	10
TNCX_140513_003	1	8	800	SW	3	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140513_003	2	7	800	SW	3	nil	10
TNCX_140520_001	0	2	1200	E	2	nil	10
TNCX_140520_001	1	2	1200	E	2	nil	10
TNCX_140520_001	2	1	1200	E	3	nil	10
TNCX_140520_002	0	1	1200	E	3	nil	10
TNCX_140520_002	1	1	1200	E	2	nil	10
TNCX_140520_002	2	1	1200	E	3	nil	10
TNCX_140520_003	0	8	1000	S	3	nil	10
TNCX_140520_003	1	9	1000	S	2	ILR	10
TNCX_140520_003	2	8	800	S	2	ILR	10
TNCX_140528_001	0	10	800	E	4	nil	10
TNCX_140528_001	1	10	800	E	3	nil	10
TNCX_140528_001	2	10	800	E	4	ILR	10
TNCX_140530_001	0	1	1200	SW	2	nil	10
TNCX_140530_001	1	1	1200	SW	1	nil	10
TNCX_140530_001	2	0		SW	1	nil	10
TNCX_140530_002	0	0		SW	2	nil	10
TNCX_140530_002	1	1	1200	SW	2	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140616_001	0	9	1000	N	3	nil	10
TNCX_140616_001	1	8	1000	N	3	nil	10
TNCX_140616_001	2	8	1000	N	4	nil	10
TNCX_140616_002	0	10	1000	N	3	nil	10
TNCX_140616_002	1	10	1000	NW	3	nil	10
TNCX_140616_002	2	10	1000	NW	3	nil	10
TNCX_140617_003	0	10	600	NW	3	nil	10
TNCX_140617_003	1	10	700	NW	3	nil	10
TNCX_140617_003	2	9	600	NW	3	nil	10
TNCX_140617_004	0	8	700	NW	3	nil	10
TNCX_140617_004	1	9	700	W	3	nil	10
TNCX_140617_004	2	8	700	W	3	nil	10
TNCX_140617_005	0	9	1000	N	4	nil	10
TNCX_140617_005	1	9	1000	N	4	nil	10
TNCX_140617_005	2	8	1000	N	3	nil	10
TNCX_140617_006	0	4	1000	N	3	nil	10
TNCX_140617_006	1	4	1000	NW	4	nil	10
TNCX_140617_006	2	3	1000	NW	4	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140619_003	0	10	800	NW	4	nil	10
TNCX_140619_003	1	10	800	NW	4	ILR	10
TNCX_140619_003	2	9	800	NW	3	ILR	10
TNCX_140619_003	3	8	800	NW	3	nil	10
TNCX_140620_003	0	10	800	NW	4	nil	10
TNCX_140620_003	1	10	800	NW	4	nil	10
TNCX_140620_003	2	10	800	NW	4	ILR	10
TNCX_140620_004	0	10	800	NW	4	nil	10
TNCX_140620_004	1	8	800	NW	4	nil	10
TNCX_140620_004	2	8	800	W	5	nil	10
TNCX_140623_001	0	9	600	N	2	nil	10
TNCX_140623_001	1	10	600	N	2	nil	10
TNCX_140623_001	2	10	500	N	2	nil	10
TNCX_140623_002	0	10	600		0	nil	10
TNCX_140623_002	1	10	500	N	1	ILR	10
TNCX_140623_002	2	10	500		0	ILR	5
TNCX_140623_003	0	10	700	W	2	CLR	5
TNCX_140623_003	1	10	600	W	2	CLR	5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140623_003	2	10	600	W	2	ILR	5
TNCX_140623_004	0	10	600	W	2	nil	5
TNCX_140623_004	1	10	600	NW	3	ILR	5
TNCX_140623_004	2	9	700	NW	3	nil	10
TNCX_140624_001	0	3	1000	E	4	nil	10
TNCX_140624_001	1	3	1000	NE	4	nil	10
TNCX_140624_001	2	4	1000	NE	4	nil	10
TNCX_140630_001	0	10	800	W	2	nil	10
TNCX_140630_001	1	10	800	NW	1	nil	10
TNCX_140630_001	2	10	800	NW	1	ILR	10
TNCX_140707_001	0	8	800	W	4	IHR	10
TNCX_140707_001	1	7	800	W	5	nil	10
TNCX_140707_001	2	6	800	W	4	nil	10
TNCX_140708_001	0	8	1200		0	nil	10
TNCX_140708_001	1	9	1200		0	nil	10
TNCX_140708_001	2	9	1200		0	nil	10
TNCX_140715_001	0	9	800	W	3	nil	10
TNCX_140715_001	1	8	800	W	3	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140715_001	2	7	800	W	3	nil	10
TNCX_140715_002	0	6	1000	W	3	nil	10
TNCX_140715_002	1	6	1000	W	2	nil	10
TNCX_140715_002	2	5	1000	W	2	nil	10
TNCX_140718_001	0	4	1200	SE	4	nil	10
TNCX_140718_001	1	6	1200	SE	5	nil	10
TNCX_140718_001	2	8	1200	SE	5	nil	10
TNCX_140718_002	0	1	1200	SE	2	nil	10
TNCX_140718_002	1	1	1200	SE	2	nil	10
TNCX_140718_002	2	0	1200	SE	3	nil	10
TNCX_140718_003	0	0		SE	3	nil	10
TNCX_140718_003	1	1	1200	SE	2	nil	10
TNCX_140718_003	2	1	1200	SE	3	nil	10
TNCX_140722_001	0	8	1000	W	2	nil	10
TNCX_140722_001	1	6	1000	NW	2	nil	10
TNCX_140722_001	2	6	1000	N	2	nil	10
TNCX_140722_002	0	2	1000	N	3	nil	10
TNCX_140722_002	1	2	1000	N	3	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140722_002	2	3	1000	N	1	nil	10
TNCX_140722_003	0	1	1500	SW	1	nil	10
TNCX_140722_003	1	0	1500	SW	2	nil	10
TNCX_140722_003	2	1	1500	SW	1	nil	10
TNCX_140722_004	0	1	1500	SW	1	nil	10
TNCX_140722_004	1	1	1500	SW	1	nil	10
TNCX_140722_004	2	1	1500	SW	2	nil	10
TNCX_140723_001	0	2	1200	N	2	nil	10
TNCX_140723_001	1	1	1200	NW	1	nil	10
TNCX_140723_001	2	1	1200	NW	1	nil	10
TNCX_140723_002	0	1	1200	NW	1	nil	10
TNCX_140723_002	1	1	1200	NW	1	nil	10
TNCX_140723_002	2	0			0	nil	10
TNCX_140723_003	0	3	1200	NE	2	nil	10
TNCX_140723_003	1	2	1200	N	2	nil	10
TNCX_140723_003	2	1	1200	N	3	nil	10
TNCX_140728_001	0	9	1000	W	2	nil	10
TNCX_140728_001	1	10	1000	NW	3	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140728_001	2	9	1000	W	3	nil	10
TNCX_140814_001	0	10	600	W	3	nil	10
TNCX_140814_001	1	10	600	W	4	ILR	5
TNCX_140814_001	2	10	600	W	3	nil	10
TNCX_140814_002	0	9	800	NW	3	nil	10
TNCX_140814_002	1	9	800	NW	3	nil	10
TNCX_140814_002	2	9	800	NW	3	nil	10
TNCX_140814_003	0	8	800	NW	3	nil	10
TNCX_140814_003	1	9	700	NW	4	IHR	5
TNCX_140814_003	2	10	600	NW	3	CLR	5
TNCX_140814_004	0	10	600	NW	3	CLR	5
TNCX_140814_004	1	9	600	NW	3	ILR	10
TNCX_140814_004	2	9	600	NW	3	nil	10
TNCX_140814_006	0	10	800	NW	3	nil	10
TNCX_140814_006	1	10	800	NW	4	nil	10
TNCX_140814_006	2	10	800	NW	4	nil	10
TNCX_140814_006	3	9	800	N	3	nil	10
TNCX_140815_001	0	9	800	N	3	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140815_001	1	9	800	N	3	nil	10
TNCX_140815_001	2	10	800	N	4	nil	10
TNCX_140815_002	0	10	800	NW	4	nil	10
TNCX_140815_002	1	10	800	W	4	nil	10
TNCX_140815_002	2	10	800	W	3	nil	10
TNCX_140815_003	0	10	800	NW	3	nil	10
TNCX_140815_003	1	10	800	NW	2	nil	10
TNCX_140815_003	2	10	700	NW	3	nil	10
TNCX_140815_004	0	9	700	NW	3	nil	10
TNCX_140815_004	1	9	700	NW	3	nil	10
TNCX_140815_004	2	10	700	NW	4	CLR	5
TNCX_140815_006	0	10	800	N	4	nil	10
TNCX_140815_006	1	10	800	N	4	nil	10
TNCX_140815_006	2	10	800	N	4	nil	10
TNCX_140819_001	0	9	800	NW	4	nil	10
TNCX_140819_001	1	10	800	NW	5	nil	10
TNCX_140819_001	2	9	800	NW	4	nil	10
TNCX_140819_002	0	10	600	SW	4	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140819_002	1	9	600	SW	5	ILR	10
TNCX_140819_002	2	7	600	SW	4	nil	10
TNCX_140819_003	0	7	800	SW	5	nil	10
TNCX_140819_003	1	7	800	W	4	nil	10
TNCX_140819_003	2	8	800	W	5	nil	10
TNCX_140819_004	0	8	800	NW	4	nil	10
TNCX_140819_004	1	9	800	NW	4	IHR	5
TNCX_140819_004	2	9	800	NW	5	nil	10
TNCX_140924_001	0	8	600	W	3	nil	10
TNCX_140924_001	1	9	600	W	3	nil	10
TNCX_140924_001	2	9	600	W	4	nil	10
TNCX_140924_002	0	8	800	NW	4	nil	10
TNCX_140924_002	1	8	800	NW	3	nil	10
TNCX_140924_003	0	8	800	NW	3	nil	10
TNCX_140924_003	1	8	800	W	3	nil	10
TNCX_140924_003	2	8	800	W	4	nil	10
TNCX_140924_004	0	8	800	NW	4	nil	10
TNCX_140924_004	1	7	800	NW	4	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140924_004	2	8	800	NW	4	nil	10
TNCX_140924_004	3	6	800	NW	4	nil	10
TNCX_140925_001	0	9	700	W	5	nil	10
TNCX_140925_001	1	9	800	W	5	nil	10
TNCX_140925_001	2	9	800	W	5	nil	10
TNCX_140925_001	3	8	800	W	5	nil	10
TNCX_140925_002	0	10	600	W	6	nil	10
TNCX_140925_002	1	10	600	W	6	nil	10
TNCX_140925_002	2	10	600	W	5	nil	10
TNCX_140925_003	0	9	600	W	5	nil	10
TNCX_140925_003	1	8	700	W	5	nil	10
TNCX_140925_003	2	9	600	W	6	ILR	10
TNCX_140925_004	0	5	800	W	4	nil	10
TNCX_140925_004	1	5	800	W	5	nil	10
TNCX_140925_005	0	5	800	W	4	nil	10
TNCX_140925_005	1	6	800	W	4	nil	10
TNCX_140925_005	2	5	800	W	5	nil	10
TNCX_140926_001	0	4	800	W	5	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140926_001	1	5	800	W	5	nil	10
TNCX_140926_001	2	3	800	W	5	nil	10
TNCX_140926_002	0	3	800	W	5	nil	10
TNCX_140926_002	1	6	800	W	5	nil	10
TNCX_140926_002	2	8	800	W	5	nil	10
TNCX_140926_003	0	7	800	W	5	nil	10
TNCX_140926_003	1	6	800	W	6	nil	10
TNCX_140926_004	0	1	800	W	4	nil	10
TNCX_140926_004	1	2	800	W	4	nil	10
TNCX_140926_004	2	1	800	W	5	nil	10
TNCX_140926_005	0	1	800	W	4	nil	10
TNCX_140926_005	1	4	800	W	5	nil	10
TNCX_141007_001	0	10	600	NW	3	CLR	5
TNCX_141007_001	1	10	500	NW	3	CLR	2
TNCX_141007_002	0	10	600	W	4	CLR	10
TNCX_141007_002	1	10	600	W	4	ILR	10
TNCX_141007_002	2	10	600	W	4	ILR	10
TNCX_141007_003	0	10	700	W	4	ILR	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_141007_003	1	10	700	W	3	ILR	10
TNCX_141007_004	0	10	700	W	4	nil	10
TNCX_141007_004	1	10	700	W	3	ILR	10
TNCX_141010_001	0	1	1200	SW	1	nil	10
TNCX_141010_001	1	2	1200	SW	2	nil	10
TNCX_141013_001	0	10	500	NE	2	CLR	1
TNCX_141013_001	1	10	600	NE	2	CLR	5
TNCX_141013_002	0	8	800	NE	2	nil	10
TNCX_141013_002	1	8	800	NE	2	nil	10
TNCX_141013_002	2	10	600	NE	1	ILR	5
TNCX_141020_001	0	9	800	SW	4	nil	10
TNCX_141020_001	1	8	800	SW	5	nil	10
TNCX_141020_002	0	8	800	SW	5	nil	10
TNCX_141020_002	1	9	800	SW	4	nil	10
TNCX_141028_001	0	7	700	SW	4	nil	10
TNCX_141028_001	1	7	800	SW	4	nil	10
TNCX_141028_001	2	6	800	SW	3	nil	10
TNCX_141030_002	0	9	800	SW	3	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_141030_002	1	9	800	SW	3	nil	10
TNCX_141030_002	2	9	700	SW	3	ILR	10
TNCX_141030_003	0	9	700	S	3	nil	10
TNCX_141030_003	1	8	700	S	4	nil	10
TNCX_141031_001	0	9	800	SW	4	nil	10
TNCX_141031_001	1	8	800	SW	4	nil	10
TNCX_141031_002	0	9	800	SW	4	nil	10
TNCX_141031_002	1	10	800	SW	5	nil	10
TNCX_141031_002	2	9	800	SW	4	nil	10
TNCX_141105_001	0	8	800	NW	2	nil	8
TNCX_141105_001	1	8	800	NW	3	nil	8
TNCX_141105_002	0	8	800	NW	3	nil	8
TNCX_141105_002	1	9	700	NW	2	ILH	5
TNCX_141105_002	2	9	800	NW	2	nil	8
TNCX_141105_003	0	7	800	N	1	nil	10
TNCX_141105_003	1	8	800	N	1	nil	10
TNCX_141107_001	0	10	700	S	3	CLR	5
TNCX_141107_001	1	10	600	S	5	ILR	5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_141107_002	0	10	700	S	3	CLR	5
TNCX_141107_002	1	10	600	SW	3	ILR	5
TNCX_141111_001	0	8	800	S	2	nil	10
TNCX_141111_001	1	9	800	S	3	nil	10
TNCX_141111_001	2	9	800	S	4	nil	10
TNCX_141111_002	0	9	800	S	5	nil	10
TNCX_141111_002	1	9	800	S	5	nil	10
TNCX_141113_001	0	9	800	S	4	nil	10
TNCX_141113_001	1	8	800	S	5	nil	10
TNCX_141113_002	0	9	800	S	5	nil	10
TNCX_141113_002	1	9	800	S	6	nil	10
TNCX_141113_002	2	9	800	S	5	nil	10
TNCX_141124_001	0	10	800	SW	4	nil	10
TNCX_141124_001	1	10	800	SW	3	nil	10
TNCX_141124_001	2	10	800	SW	3	nil	10
TNCX_141125_001	0	3	1000	S	2	nil	10
TNCX_141125_001	1	4	1000	S	2	nil	10
TNCX_141125_001	2	3	1000	S	1	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_141125_002	0	3	1000	S	1	nil	10
TNCX_141125_002	1	4	1000	S	2	nil	10
TNCX_141204_001	0	4	800	SW	3	nil	10
TNCX_141204_001	1	3	800	SW	4	ILR	10
TNCX_141204_002	0	2	800	SW	4	nil	10
TNCX_141204_002	1	2	800	SW	3	nil	10
TNCX_141204_003	0	9	700	SW	3	nil	10
TNCX_141204_003	1	8	800	SW	3	nil	10
TNCX_141204_004	0	7	700	SW	3	nil	10
TNCX_141204_004	1	8	800	SW	3	nil	10
TNCX_141204_004	2	8	800	SW	3	nil	10
TNCX_141205_001	0	4	700	W	4	nil	10
TNCX_141205_001	1	4	700	W	4	nil	10
TNCX_141205_002	0	4	700	W	4	nil	10
TNCX_141205_002	1	5	700	W	3	nil	10
TNCX_141205_003	0	10	600	S	5	nil	10
TNCX_141205_003	1	4	700	S	5	nil	10
TNCX_141205_004	0	2	800	S	4	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_141205_004	1	4	800	S	4	nil	10
TNCX_141205_004	2	7	800	S	4	nil	10
TNCX_141215_001	0	2	1200	W	3	nil	10
TNCX_141215_001	1	7	1200	W	2	nil	10
TNCX_141215_001	2	6	1200	W	2	nil	10
TNCX_141218_001	0	8	800	SW	4	nil	10
TNCX_141218_001	1	7	800	SW	4	nil	10
TNCX_141218_001	2	9	700	SW	4	ILR	10
TNCX_141218_001	3	9	600	SW	4	ILR	10
TNCX_150108_001	0	8	800	SW	5	nil	10
TNCX_150108_001	1	6	800	SW	4	nil	10
TNCX_150108_001	2	9	700	SW	5	ILS	10
TNCX_150108_002	0	10	600	SW	5	CHS	1
TNCX_150108_002	1	8	700	SW	4	ILS	5
TNCX_150108_003	0	9	800	SW	4	ILS	5
TNCX_150108_003	1	7	800	SW	5	nil	10
TNCX_150108_004	0	6	800	SW	5	nil	10
TNCX_150108_004	1	6	800	SW	5	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150108_004	2	7	800	SW	5	nil	10
TNCX_150113_001	0	7	800	SW	5	nil	10
TNCX_150113_001	1	8	800	SW	4	nil	10
TNCX_150113_001	2	9	800	SW	5	nil	8
TNCX_150113_002	0	9	800	SW	5	nil	5
TNCX_150113_002	1	10	700	SW	6	IHS	2
TNCX_150114_001	0	9	800	SW	5	CLS	5
TNCX_150114_001	1	9	800	SW	6	ILS	5
TNCX_150114_002	0	8	800	SW	5	nil	10
TNCX_150114_002	1	6	800	SW	4	nil	10
TNCX_150212_001	0	7	1000	SW	4	nil	10
TNCX_150212_001	1	6	1000	SW	3	nil	10
TNCX_150212_001	2	7	1000	SW	4	nil	10
TNCX_150212_001	3	6	1000	SW	3	nil	10
TNCX_150212_002	0	8	1000	SW	3	nil	10
TNCX_150212_002	1	9	1000	SW	3	nil	10
TNCX_150212_002	2	9	1000	SW	3	nil	10
TNCX_150212_003	0	9	1000	SW	3	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150212_003	1	8	1000	SW	3	nil	10
TNCX_150213_001	0	10	700	SW	3	nil	10
TNCX_150213_001	1	10	800	SW	3	nil	10
TNCX_150213_002	0	9	800	SW	3	nil	10
TNCX_150213_002	1	8	800	SW	3	nil	10
TNCX_150214_001	0	8	700	S	3	nil	5
TNCX_150214_001	1	9	700	S	4	nil	5
TNCX_150214_001	2	9	700	S	4	nil	8
TNCX_150214_001	3	9	700	S	4	nil	8
TNCX_150214_002	0	9	800	S	4	nil	10
TNCX_150214_002	1	8	800	S	3	nil	10
TNCX_150217_001	0	8	1000	SW	4	nil	10
TNCX_150217_001	1	9	1000	W	5	nil	10
TNCX_150217_001	2	9	1000	W	5	ILR	10
TNCX_150316_001	0	10	600	SE	1	ILR	3
TNCX_150316_002	0	10	600	SE	2	nil	3
TNCX_150316_002	1	10	600	SE	2	ILR	2
TNCX_150316_003	0	10	600	SE	3	nil	8

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150316_003	1	10	600	SE	3	ILR	5
TNCX_150317_001	0	10	700	SW	2	nil	3
TNCX_150317_001	1	10	700	SW	2	nil	3
TNCX_150317_002	0	10	700	SE	3	nil	3
TNCX_150317_002	1	10	700	SE	2	nil	3
TNCX_150317_003	0	5	700	S	3	nil	5
TNCX_150317_003	1	5	700	S	2	nil	5
TNCX_150317_003	2	5	700	SW	2	nil	5
TNCX_150317_003	3	7	600	SW	1	nil	5
TNCX_150318_001	0	10	700	W	2	nil	10
TNCX_150318_001	1	8	700	W	2	nil	10
TNCX_150318_001	2	7	700	W	2	nil	10
TNCX_150318_001	3	6	800	W	2	nil	10
TNCX_150318_002	0	10	700	W	3	nil	2
TNCX_150318_002	1	10	700	W	2	nil	3
TNCX_150318_003	0	10	700	W	3	nil	3
TNCX_150318_003	1	5	700	W	3	nil	5
TNCX_150318_004	0	10	800	SE	1	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150318_004	1	10	800	nil	0	nil	10
TNCX_150318_005	0	8	800	nil	2	nil	10
TNCX_150318_005	1	7	800	SW	2	nil	10
TNCX_150319_002	0	10	600	W	2	nil	3
TNCX_150319_002	1	10	600	W	2	nil	3
TNCX_150319_004	0	9	800	SW	2	nil	10
TNCX_150319_004	1	10	800	SW	2	nil	10
TNCX_150319_004	2	10	800	SW	2	nil	10
TNCX_150319_005	0	10	800	SW	2	nil	10
TNCX_150319_005	1	10	800	SW	2	nil	10
TNCX_150319_006	0	10	800	SW	4	nil	10
TNCX_150319_006	1	10	800	SW	4	nil	10
TNCX_150319_006	2	10	800	SW	3	nil	10
TNCX_150327_001	0	8	1000	SW	4	nil	10
TNCX_150327_001	1	6	1000	SW	4	nil	10
TNCX_150327_001	2	3	1000	SW	3	nil	10
TNCX_150327_002	0	8	1000	SW	5	ILR	10
TNCX_150327_002	1	7	1000	SW	5	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150327_002	2	7	1000	SW	5	nil	10
TNCX_150405_001	0	1	1200	SW	3	nil	10
TNCX_150405_001	1	1	1200	SW	3	nil	10
TNCX_150405_001	2	1	1200	SW	3	nil	10
TNCX_150405_002	0	3	1200	SW	4	nil	10
TNCX_150405_002	1	2	1200	SW	3	nil	10
TNCX_150405_002	2	2	1200	SW	3	nil	10
TNCX_150407_001	0	8	800	SW	5	nil	10
TNCX_150407_001	1	8	800	SW	6	nil	10
TNCX_150407_001	2	9	800	SW	5	nil	10
TNCX_150407_002	0	9	800	SW	5	nil	10
TNCX_150407_002	1	9	800	SW	5	nil	10
TNCX_150407_002	2	10	800	SW	6	nil	10
TNCX_150408_001	0	2	1200	SW	4	nil	10
TNCX_150408_001	1	1	1200	SW	4	nil	10
TNCX_150408_001	2	1	1200	SW	5	nil	10
TNCX_150408_002	0	1	1000	SW	4	nil	10
TNCX_150408_002	1	1	1000	SW	5	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150408_002	2	2	1200	SW	4	nil	10
TNCX_150408_003	0	2	1500	SW	5	nil	10
TNCX_150408_003	1	2	1500	SW	5	nil	10
TNCX_150408_003	2	2	1500	SW	5	nil	10
TNCX_150408_004	0	2	1500	SW	4	nil	10
TNCX_150408_004	1	1	1500	SW	4	nil	10
TNCX_150408_004	2	3	1500	SW	4	nil	10
TNCX_150416_001	0	9	1000	N	1	nil	10
TNCX_150416_001	1	9	1000	nil	0	nil	10
TNCX_150416_002	0	9	1000	NE	1	nil	10
TNCX_150416_002	1	9	1000	NE	1	nil	10
TNCX_150416_002	2	9	1000	SW	2	nil	10
TNCX_150427_001	0	2	1000	SW	2	nil	10
TNCX_150427_001	1	6	1000	SW	3	nil	10
TNCX_150427_001	2	8	1000	SW	4	nil	10
TNCX_150427_001	3	10	1000	SW	3	nil	10
TNCX_150428_001	0	9	800	SW	4	nil	10
TNCX_150428_001	1	9	800	SW	3	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150428_001	2	7	800	SW	4	nil	10
TNCX_150428_002	0	8	800	SW	4	nil	10
TNCX_150428_002	1	7	800	SW	4	nil	10
TNCX_150428_002	2	8	800	SW	5	nil	10
TNCX_150501_001	0	8	600	NE	1	nil	10
TNCX_150501_001	1	9	600	N	2	IHH	10
TNCX_150501_001	2	10	600	N	3	IHH	10
TNCX_150511_001	0	4	1200	SW	5	nil	10
TNCX_150511_001	1	5	1000	SW	6	IHR	10
TNCX_150511_001	2	3	1200	SW	5	nil	10
TNCX_150511_002	0	3	1200	SW	5	nil	10
TNCX_150511_002	1	2	1200	SW	6	nil	10
TNCX_150511_002	2	2	1200	SW	5	nil	10
TNCX_150515_001	0	7	1000	SW	4	nil	10
TNCX_150515_001	1	8	1000	SW	4	nil	10
TNCX_150515_001	2	9	1000	SW	4	nil	10
TNCX_150515_001	3	10	1000	SW	4	ILR	10
TNCX_150515_002	0	1	1200	SW	4	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150515_002	1	6	1200	SW	4	nil	10
TNCX_150515_002	2	8	1200	SW	4	nil	10
TNCX_150515_003	0	7	1200	SW	4	nil	10
TNCX_150515_003	1	6	1200	SW	4	nil	10
TNCX_150515_003	2	6	1200	SW	4	nil	10
TNCX_150518_001	0	9	700	W	2	ILR	10
TNCX_150518_001	1	10	600	W	2	IHR	5
TNCX_150518_001	2	9	700	W	2	ILR	8
TNCX_150518_002	0	8	700	SW	4	nil	10
TNCX_150518_002	1	10	600	SW	4	CHR	5
TNCX_150518_002	2	9	700	SW	3	IHR	10
TNCX_150518_003	0	8	800	SW	3	nil	10
TNCX_150518_003	1	8	800	SW	2	nil	10
TNCX_150518_003	2	8	800	SW	1	nil	10
TNCX_150518_004	0	10	800	SW	3	CLR	10
TNCX_150518_004	1	9	800	SW	3	ILR	10
TNCX_150518_004	2	10	800	SW	2	ILR	10
TNCX_150518_004	3	10	800	SW	2	CLR	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150520_001	0	10	800	SW	3	nil	10
TNCX_150520_001	1	10	800	SW	4	nil	10
TNCX_150520_001	2	9	800	SW	4	nil	10
TNCX_150520_002	0	9	800	W	4	nil	10
TNCX_150520_002	1	10	800	W	4	IHR	10
TNCX_150520_002	2	10	800	SW	4	ILR	8
TNCX_150523_001	0	0		SW	1	nil	10
TNCX_150523_001	1	1	1200	SW	2	nil	10
TNCX_150523_001	2	1	1200	SW	2	nil	10
TNCX_150523_002	0	1	1200	SW	3	nil	10
TNCX_150523_002	1	1	1200	SW	3	nil	10
TNCX_150527_001	0	9	800	W	4	nil	10
TNCX_150527_001	1	9	800	W	4	nil	10
TNCX_150527_001	2	10	800	W	3	nil	10
TNCX_150602_001	0	10	500	SW	3	nil	10
TNCX_150602_001	1	10	600	SW	3	nil	10
TNCX_150602_001	2	10	700	SW	4	nil	10
TNCX_150602_002	0	8	700	SW	4	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150602_002	1	7	700	SW	4	nil	10
TNCX_150602_002	2	6	700	SW	4	nil	10
TNCX_150604_001	0	10	800	SW	3	CLR	10
TNCX_150604_001	1	10	800	SW	2	ILR	10
TNCX_150604_001	2	10	800	SW	2	nil	10
TNCX_150604_002	0	10	800	SW	2	nil	10
TNCX_150604_002	1	10	700	SW	2	nil	10
TNCX_150604_002	2	10	600	SW	1	nil	10
TNCX_150604_003	0	10	800	SW	4	CHR	10
TNCX_150604_003	1	10	800	SW	4	IHR	10
TNCX_150604_003	2	10	800	SW	3	ILR	10
TNCX_150611_001	0	2	1200	W	3	nil	10
TNCX_150611_001	1	3	1200	NW	3	nil	10
TNCX_150611_001	2	4	1200	NW	3	nil	10
TNCX_150611_002	0	4	1200	NW	3	nil	10
TNCX_150611_002	1	4	1200	NW	2	nil	10
TNCX_150611_002	2	3	1200	NW	2	nil	10
TNCX_150616_001	0	10	800	S	3	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150616_001	1	10	800	S	3	nil	10
TNCX_150616_001	2	10	800	SW	3	nil	10
TNCX_150616_002	0	10	800	SW	3	nil	10
TNCX_150616_002	1	10	800	SW	3	nil	10
TNCX_150616_002	2	10	800	SW	3	nil	10
TNCX_150617_001	0	10	800	SW	4	nil	10
TNCX_150617_001	1	10	800	SW	5	nil	10
TNCX_150617_001	2	10	800	SW	4	nil	10
TNCX_150617_002	0	10	800	SW	4	nil	10
TNCX_150617_002	1	10	800	SW	5	nil	10
TNCX_150617_002	2	10	800	SW	5	nil	10
TNCX_150629_001	0	9	800	SW	3	nil	10
TNCX_150629_001	1	9	800	SW	3	nil	10
TNCX_150629_001	2	9	800	SW	2	nil	10
TNCX_150629_002	0	9	800	SW	2	nil	10
TNCX_150629_002	1	9	800	SW	2	nil	10
TNCX_150629_002	2	10	800	SW	3	CLR	10
TNCX_150629_003	0	7	800	S	3	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150629_003	1	9	800	SW	4	nil	10
TNCX_150629_003	2	9	800	SW	3	nil	10
TNCX_150629_004	0	9	800	S	4	nil	10
TNCX_150629_004	1	9	800	SW	4	nil	10
TNCX_150629_004	2	8	800	SW	4	nil	10
TNCX_150709_001	0	9	1000	W	3	nil	10
TNCX_150709_001	1	9	1000	W	3	nil	10
TNCX_150709_001	2	10	1000	W	2	nil	10
TNCX_150723_001	0	4	1200	SW	5	nil	10
TNCX_150723_001	1	3	1200	SW	5	nil	10
TNCX_150723_001	2	3	1200	SW	6	nil	10
TNCX_150723_002	0	2	1200	SW	6	nil	10
TNCX_150723_002	1	2	1200	SW	6	nil	10
TNCX_150723_002	2	3	1200	SW	6	nil	10
TNCX_150723_003	0	8	1000	SW	7	nil	10
TNCX_150723_003	1	10	800	SW	7	IHR	4
TNCX_150723_003	2	10	800	SW	7	CHR	4
TNCX_150723_004	0	10	800	SW	6	ILR	5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150723_004	1	9	800	SW	5	ILR	10
TNCX_150723_004	2	9	800	SW	5	ILR	10
TNCX_150723_005	0	2	1200	SW	6	nil	10
TNCX_150723_005	1	2	1200	SW	5	nil	10
TNCX_150723_005	2	3	1200	SW	5	nil	10
TNCX_150723_005	3	4	1200	SW	6	nil	10
TNCX_150724_001	0	8	1000	SW	2	nil	10
TNCX_150724_001	1	8	1000	SW	3	nil	10
TNCX_150724_001	2	9	800	W	3	IHR	3
TNCX_150724_001	3	8	800	W	3	ILR	5
TNCX_150724_002	0	8	800	NW	3	nil	10
TNCX_150724_002	1	7	800	NW	3	nil	10
TNCX_150724_003	0	7	800	NW	3	nil	10
TNCX_150724_003	1	8	800	NW	2	nil	10
TNCX_150724_003	2	9	800	nil	0	nil	10
TNCX_150727_001	0	10	800	E	3	CLR	8
TNCX_150727_001	1	10	700	E	3	CLR	8
TNCX_150727_001	2	10	700	NE	3	ILR	8

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150727_001	3	10	700	NE	3	CLR	8
TNCX_150730_001	0	8	800	W	2	nil	10
TNCX_150730_001	1	7	1000	W	2	nil	10
TNCX_150730_001	2	6	1000	W	2	nil	10
TNCX_150730_002	0	7	1000	W	2	nil	10
TNCX_150730_002	1	8	1000	W	2	nil	10
TNCX_150730_002	2	8	1000	W	3	nil	10
TNCX_150730_003	0	10	800	W	4	nil	10
TNCX_150730_003	1	9	800	W	4	nil	10
TNCX_150730_003	2	8	800	SW	4	nil	10
TNCX_150730_003	3	8	800	SW	3	nil	10
TNCX_150804_001	0	9	800	S	7	nil	10
TNCX_150804_001	1	9	800	S	6	ILR	5
TNCX_150804_001	2	9	800	S	6	ILR	5
TNCX_150804_002	0	9	700	S	6	nil	10
TNCX_150804_002	1	9	700	S	6	nil	10
TNCX_150804_002	2	9	800	S	6	nil	10
TNCX_150804_003	0	8	800	S	6	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150804_003	1	8	800	S	7	nil	10
TNCX_150804_003	2	8	800	S	6	nil	10
TNCX_150804_004	0	3	1000	SW	6	nil	10
TNCX_150804_004	1	3	1000	SW	6	nil	10
TNCX_150804_004	2	3	1000	W	6	nil	10
TNCX_150806_001	0	8	1000	W	4	nil	10
TNCX_150806_001	1	9	1000	W	4	nil	10
TNCX_150806_002	0	9	1000	W	5	nil	10
TNCX_150806_002	1	9	800	W	5	ILR	10
TNCX_150806_002	2	8	800	W	5	nil	10
TNCX_150806_003	0	8	800	W	4	nil	10
TNCX_150806_003	1	7	1000	W	4	nil	10
TNCX_150806_003	2	7	1000	W	5	nil	10
TNCX_150806_004	0	8	700	W	4	nil	10
TNCX_150806_004	1	8	700	W	4	nil	10
TNCX_150806_004	2	9	800	W	4	nil	10
TNCX_150806_004	3	9	800	W	4	nil	10
TNCX_150807_001	0	8	1000	SW	4	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150807_001	1	8	1000	SW	4	nil	10
TNCX_150807_001	2	8	1000	SW	3	nil	10
TNCX_150807_002	0	8	1000	SW	3	nil	10
TNCX_150807_002	1	7	1000	SW	3	nil	10
TNCX_150807_003	0	8	1000	SW	5	nil	10
TNCX_150807_003	1	9	1000	SW	5	nil	10
TNCX_150807_003	2	10	1000	SW	5	nil	10
TNCX_150810_001	0	4	1200	SW	4	nil	10
TNCX_150810_001	1	7	1200	SW	4	nil	10
TNCX_150810_002	0	9	1000	SW	4	nil	10
TNCX_150810_002	1	9	1000	SW	4	ILR	10
TNCX_150810_002	2	8	1000	SW	4	nil	10
TNCX_150811_001	0	8	700	SW	4	nil	10
TNCX_150811_001	1	10	500	W	4	CLR	1
TNCX_150811_002	0	10	600	NW	4	nil	5

Annex 1.4 Flight Activity Survey Species Lists and BTO Codes

List A		List B		List C	
Species	**BTO Code**	**Species**	**BTO Code**	**Species**	**BTO Code**
Diver spp.	RH/BV	Greylag goose	GJ	Cormorant	CA
Common scoter	CX	Barnacle goose	BY	Heron	H.
White-tailed eagle	WE	White-fronted goose	$EW_{(Euro)}/NW_{(Grld)}$	Kestrel	K.
Golden eagle	EA	Pink-footed goose	PG	Buzzard	BZ
Hen harrier	HH	Brent goose	$DB_{(Dark)}/PB_{(Pale)}$	Sparrowhawk	SH
Goshawk	GI	Bean goose	BE	Red grouse	RG
Red kite	KT	Golden plover	GP	Grey partridge	P.
Osprey	OP	Dunlin	DN	Lapwing	L.
Merlin	ML	Greenshank	GK	Redshank	RK
Peregrine	PE	Whimbrel	WM	Common sandpiper	CS
Hobby	HY	Curlew	CU	Oystercatcher	OC
Barn owl	BO	Wood sandpiper	OD	Snipe	SN
Short-eared owl	SE	Tern spp.	AE/CN	Woodcock	WK
Black grouse	BK	Arctic Skua	AC	Herring gull	HG
Capercaillie	CP	Great Skua	NX	Cuckoo	CK
Nightjar	NJ			Ring ouzel	RZ
Chough	CF			Raven	RN
Whooper swan	WS				
Rare raptors	HZ/MR/RF/YF				

Annex - 1.5 Migration VP details

***Watch ID relates to Annex 1.6 Weather Details**

Date	Obs	MWP	Start	End	Duration	Watch ID*
24/09/2014	JAC	A	0930	1130	2.00	TNCX_140924_005
07/10/2014	JAC	A	0945	1245	3.00	TNCX_141007_005
10/10/2014	JAC	A	0845	1145	3.00	TNCX_141010_002
13/10/2014	JAC	A	1200	1500	3.00	TNCX_141013_003
20/10/2014	JAC	A	1200	1500	3.00	TNCX_141020_003
28/10/2014	JAC	A	1015	1115	1.00	TNCX_141028_002
28/10/2014	JAC	A	1400	1600	2.00	TNCX_141028_003
30/10/2014	JAC	A	1045	1315	2.50	TNCX_141030_001
31/10/2014	JAC	A	1545	1645	1.00	TNCX_141031_003
05/11/2014	JAC	A	1130	1430	3.00	TNCX_141105_004
09/11/2014	JAC	A	1100	1400	3.00	TNCX_141109_001
11/11/2014	JAC	A	0930	1230	3.00	TNCX_141111_003
13/11/2014	JAC	A	1130	1430	3.00	TNCX_141113_003
24/11/2014	JAC	A	1230	1400	1.50	TNCX_141124_002
25/11/2014	JAC	A	1030	1230	2.00	TNCX_141125_003
18/03/2015	JAC	B	0905	1205	3.00	TNCX_150318_006
19/03/2015	KJD	B	0830	1130	3.00	TNCX_150319_003
27/03/2015	JAC	B	0900	1200	3.00	TNCX_150327_003
05/04/2015	JAC	B	0900	1200	3.00	TNCX_150405_003
07/04/2015	JAC	B	1030	1330	3.00	TNCX_150407_003
08/04/2015	JAC	B	1100	1400	3.00	TNCX_150408_005
27/04/2015	FL	B	1405	1605	2.00	TNCX_150427_002
28/04/2015	JAC	B	1400	1700	3.00	TNCX_150428_003
30/04/2015	JAC	B	0900	1200	3.00	TNCX_150430_001
01/05/2015	JAC	B	0700	1000	3.00	TNCX_150501_002

Annex - 1.6 Weather details for MWP

***Precipitation codes: Continuous/Intermittent + Light/Heavy + Rain/Snow/Hail/Fog**

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_140924_005	0	10	500	NW	4	ILR	5
TNCX_140924_005	1	10	500	NW	4	ILR	2
TNCX_140924_005	2	8	600	NW	3	nil	10
TNCX_141007_005	0	10	600	NW	3	CHR	2
TNCX_141007_005	1	10	600	NW	3	CLR	2
TNCX_141007_005	2	10	600	W	3	CLR	5
TNCX_141007_005	3	10	700	W	3	ILR	5
TNCX_141010_002	0	3	1200	SW	2	nil	10
TNCX_141010_002	1	2	1200	SW	2	nil	10
TNCX_141010_002	2	1	1200	SW	2	nil	10
TNCX_141010_002	3	1	1200	SW	2	nil	10
TNCX_141013_003	0	10	700	NE	3	ILR	5
TNCX_141013_003	1	8	800	NE	2	nil	10
TNCX_141013_003	2	9	700	NE	3	ILR	5
TNCX_141013_003	3	8	800	NE	1	nil	10
TNCX_141020_003	0	8	800	W	5	nil	10
TNCX_141020_003	1	6	800	SW	5	ILR	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_141020_003	2	7	800	SW	5	nil	10
TNCX_141020_003	3	8	800	SW	5	nil	10
TNCX_141028_002	0	9	600	SW	4	ILR	5
TNCX_141028_002	1	8	700	SW	4	nil	10
TNCX_141028_003	0	7	800	SW	4	ILR	10
TNCX_141028_003	1	5	800	SW	3	nil	10
TNCX_141028_003	2	7	800	SW	3	ILR	10
TNCX_141030_001	0	9	800	SW	4	nil	10
TNCX_141030_001	1	9	800	SW	4	ILR	10
TNCX_141030_001	2	9	800	S	4	ILR	10
TNCX_141030_001	3	8	800	S	4	nil	10
TNCX_141031_003	0	8	800	SW	4	nil	10
TNCX_141031_003	1	9	800	SW	4	nil	10
TNCX_141105_004	0	9	800	N	2	ILS	5
TNCX_141105_004	1	9	800	N	2	nil	10
TNCX_141105_004	2	8	800	N	1	nil	10
TNCX_141105_004	3	7	800	N	1	nil	10
TNCX_141109_001	0	10	700	SW	3	ILR	5

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_141109_001	1	10	600	SW	4	CLR	5
TNCX_141109_001	2	9	800	S	4	nil	10
TNCX_141109_001	3	9	800	SW	3	nil	10
TNCX_141111_003	0	9	700	SE	4	nil	10
TNCX_141111_003	1	9	800	SE	3	nil	10
TNCX_141111_003	2	9	800	SW	3	nil	10
TNCX_141111_003	3	8	800	SW	2	nil	10
TNCX_141113_003	0	9	800	S	4	nil	10
TNCX_141113_003	1	9	800	S	5	nil	10
TNCX_141113_003	2	9	800	S	6	nil	10
TNCX_141124_002	0	10	800	SW	4	nil	10
TNCX_141124_002	1	9	800	SW	5	nil	10
TNCX_141124_002	2	9	800	SW	4	nil	10
TNCX_141125_003	0	1	1000	S	1	nil	10
TNCX_141125_003	1	2	1000	S	2	nil	10
TNCX_141125_003	2	2	1000	S	3	nil	10
TNCX_150318_006	0	8	800	S	1	nil	10
TNCX_150318_006	1	9	800	W	1	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150318_006	2	9	800	W	1	nil	10
TNCX_150318_006	3	9	800	W	2	nil	10
TNCX_150319_003	0	10	700	W	4	nil	5
TNCX_150319_003	1	10	700	W	4	nil	5
TNCX_150319_003	2	10	700	W	4	nil	5
TNCX_150319_003	3	10	700	W	4	nil	5
TNCX_150327_003	0	7	1000	SW	5	nil	10
TNCX_150327_003	1	5	1000	SW	5	nil	10
TNCX_150327_003	2	4	1000	SW	4	nil	10
TNCX_150327_003	3	6	1000	SW	6	nil	10
TNCX_150405_003	0	1	1200	SW	4	nil	10
TNCX_150405_003	1	1	1200	SW	4	nil	10
TNCX_150405_003	2	2	1200	SW	4	nil	10
TNCX_150405_003	3	3	1200	SW	4	nil	10
TNCX_150407_003	0	10	800	SW	6	nil	10
TNCX_150407_003	1	10	1000	SW	6	nil	10
TNCX_150407_003	2	9	1000	SW	5	nil	10
TNCX_150407_003	3	9	1000	SW	4	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150408_005	0	1	1200	SW	5	nil	10
TNCX_150408_005	1	2	1200	S	5	nil	10
TNCX_150408_005	2	1	1200	S	6	nil	10
TNCX_150408_005	3	2	1200	SW	5	nil	10
TNCX_150427_002	0	10	1000	SW	3	nil	10
TNCX_150427_002	1	10	600	SW	5	nil	10
TNCX_150427_002	2	10	600	SW	4	ILS	5
TNCX_150428_003	0	8	800	SW	5	nil	10
TNCX_150428_003	1	9	800	SW	5	ILS	10
TNCX_150428_003	2	8	800	SW	4	nil	10
TNCX_150428_003	3	9	800	SW	5	nil	10
TNCX_150430_001	0	10	500	N	3	ILR	10
TNCX_150430_001	1	9	500	N	3	nil	10
TNCX_150430_001	2	10	500	N	4	IHS	5
TNCX_150430_001	3	8	500	N	4	nil	10
TNCX_150501_002	0	6	1000	NE	3	nil	10
TNCX_150501_002	1	8	800	NE	4	ILH	10
TNCX_150501_002	2	7	800	NE	3	nil	10

Watch ID	Hour	Cloud 10th	Cloud Base (m)	Wind direction	Wind force	Precipitation	Vis (km)
TNCX_150501_002	3	9	600	NE	4	ILS	5

Annex 1.7 - Other Survey Species Lists and BTO Codes

List A	
Species	**BTO Code**
Diver sp.	RH/BV
Common scoter	CX
White tailed eagle	WE
Golden eagle	EA
Hen harrier	HH
Goshawk	GI
Red kite	KT
Osprey	OP
Merlin	ML
Peregrine	PE
Hobby	HY
Barn owl	BO
Short-eared owl	SE
Black grouse	BK
Capercaillie	CP
Nightjar	NJ
Chough	CF
Whooper swan	WS
Rare raptors	HZ/MR/RF/YF

List B	
Species	**BTO Code**
Greylag goose	GJ
Barnacle goose	BY
White-front. goose	EW(Euro)/NW(Grld)

List B	
Species	**BTO Code**
Pink-footed goose	PG
Brent goose	DB(Dark)/PB(Pale)
Bean goose	BE
Golden plover	GP
Dunlin	DN
Greenshank	GK
Whimbrel	WM
Curlew	CU
Wood sandpiper	OD
Tern spp.	AE/CN
Skua spp.	AC/NX
Colonial spp. nests	H./Gull spp.

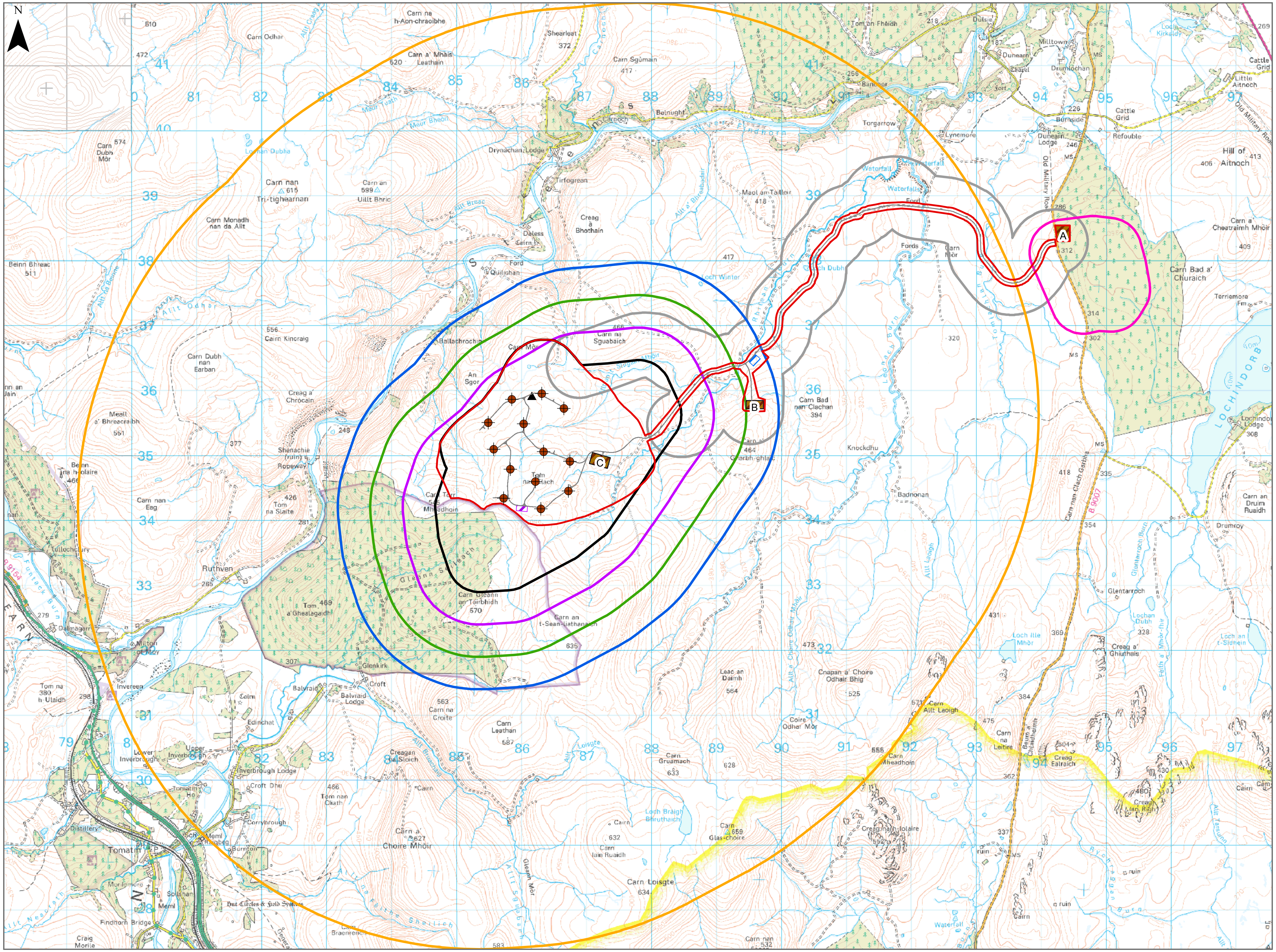
List C	
Species	**BTO Code**
Cormorant	CA
Heron	H.
Kestrel	K.
Buzzard	BZ
Sparrowhawk	SH
Red grouse	RG
Grey partridge	P.
Lapwing	L.
Redshank	RK
Common sandpiper	CS
Oystercatcher	OC

List C	
Species	**BTO Code**
Snipe	SN
Woodcock	WK
Herring gull	HG
Cuckoo	CK
Skylark	S.
Tree pipit	TP
Dunnock	D.
Ring ouzel	RZ
Song thrush	ST
Grasshopper warbler	GH
Wood warbler	WO
Spotted flycatcher	SF
Marsh/Willow tit	MT/WT
Crested tit	CI
Starling	SG
House/Tree sparrow	HS/TS
Linnet	LI
Twite	TW
Lesser redpoll	LR
Crossbill/ Scottish c'bill	CR/CY
Bullfinch	BF
Hawfinch	HF
Yellowhammer	Y.
Reed bunting	RB
Corn bunting	CB
Raven	RN

List C	
Species	**BTO Code**
Other wildfowl spp.	MS/MA/GD/T.

Figure 8.1: Ornithology Survey Areas

INFINERGY



Legend:

- Proposed turbine
- Site boundary
- Access track
- Operational hard standing
- Construction hard standing
- Substation
- Borrow pit
- Construction compound
- Met mast

Ornithology Survey Buffers

- 500 m survey buffer
- 1 km survey buffer
- 1.5 km survey buffer
- 2 km survey buffer
- 6 km survey buffer
- Borrow pit area buffer
- Access track 500 m buffer

Title: Ornithology survey areas

Project: Tom nan Clach Wind Farm Repowering

Source:

Client: Infinergy

Drawn by: FL

Checked: DS

Date: 17/08/2015

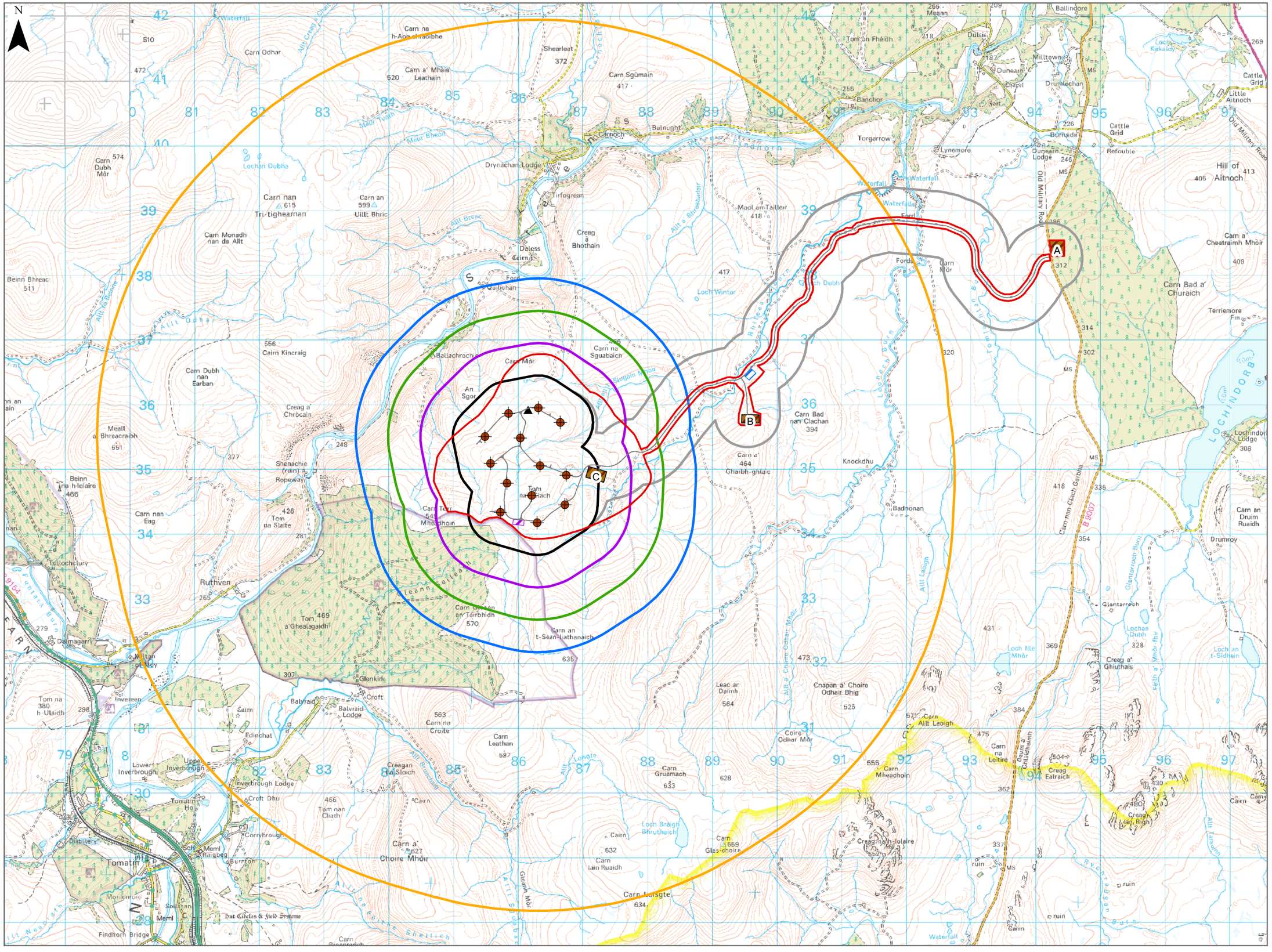
Figure: 8.1

Scale: 0 0.5 1 km

Revision No: 3

INFINERGY

INFINERGY



Legend:

- Proposed turbine
- Site boundary
- Access track
- Operational hard standing
- Construction hard standing
- Substation
- Borrow pit
- Construction compound
- Met mast

Ornithology Reporting Buffers

- 500 m reporting buffer
- 1 km reporting buffer
- 1.5 km reporting buffer
- 2 km reporting buffer
- 6 km reporting buffer
- 500 m buffer of access track

Title: Ornithology reporting buffers

Project: Tom nan Clach Wind Farm Repowering

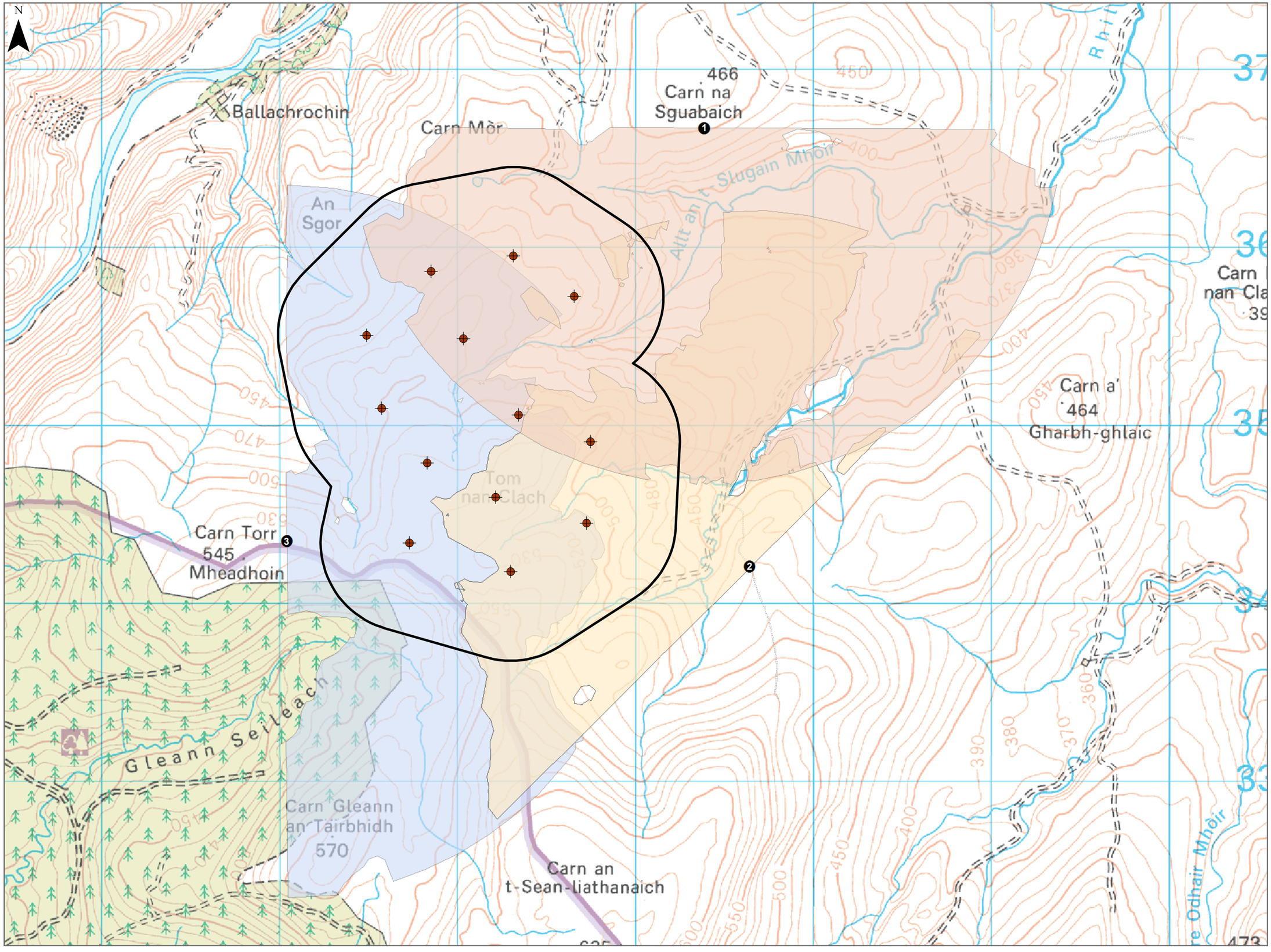
Source:

Client: Infinergy

Drawn by:	Checked:
FL	DS
Date: 17/08/2015	**Figure:** 8.2
Scale: 0 0.5 1 km	**Revision No:** 3

INFINERGY

INFINERGY



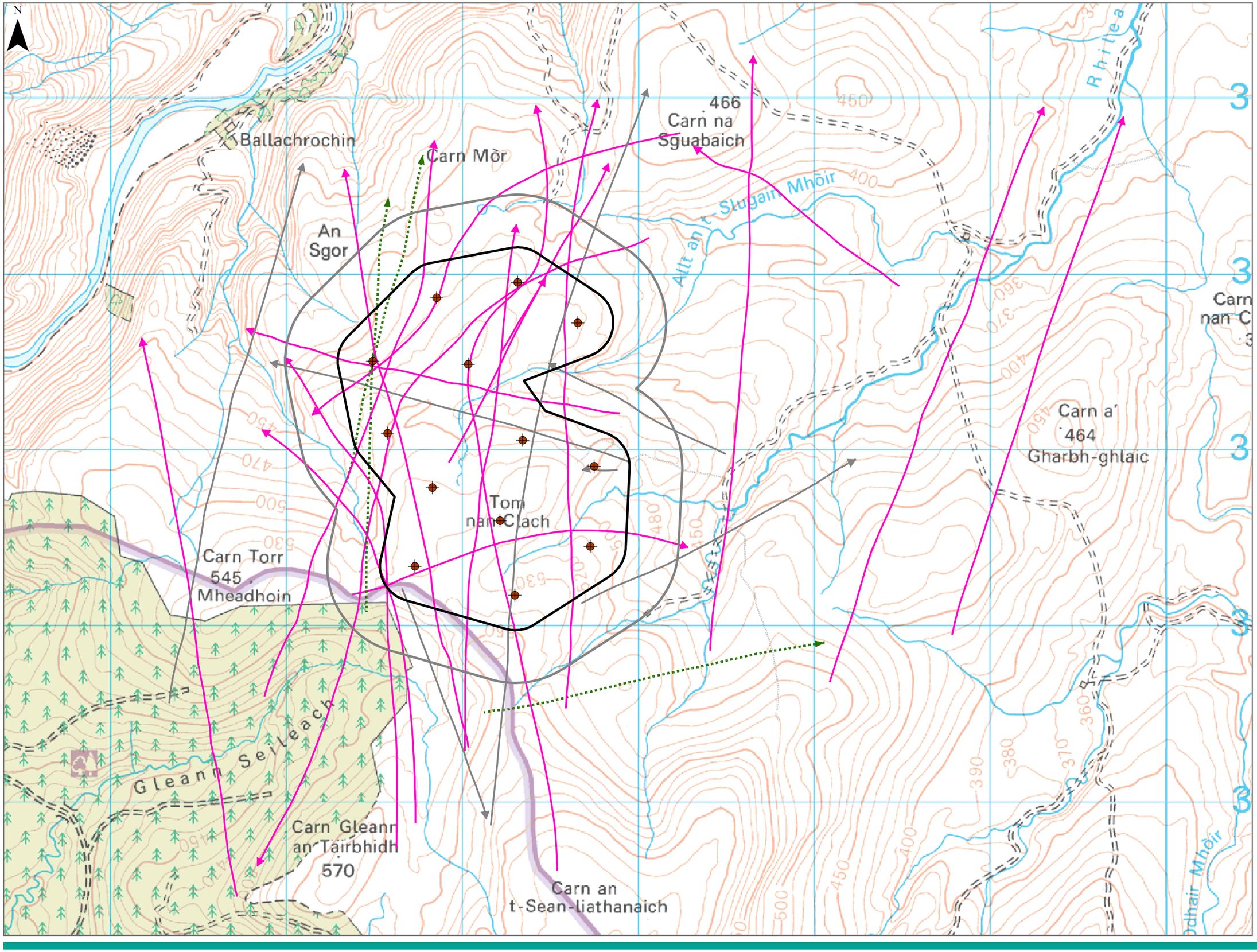
Legend:

- Proposed turbine
- 500 m reporting buffer
- GVP
- GVP 1 visibility
- GVP 2 visibility
- GVP 3 visibility

Title:	Generic Vantage Point locations and visibility
Project:	Tom nan Clach Wind Farm Repowering
Source:	© Crown copyright and database rights 2015. Ordnance Survey 0100031673
Client:	Infinergy
Drawn by: FL	**Checked:** DS
Date: 17/08/2015	**Figure:** 8.3
Scale: 0 0.2 0.4 km	**Revision No:** 3

INFINERGY

INFINERGY



Legend:

- Proposed turbine
- 200m buffer for CRM
- 500m reporting buffer

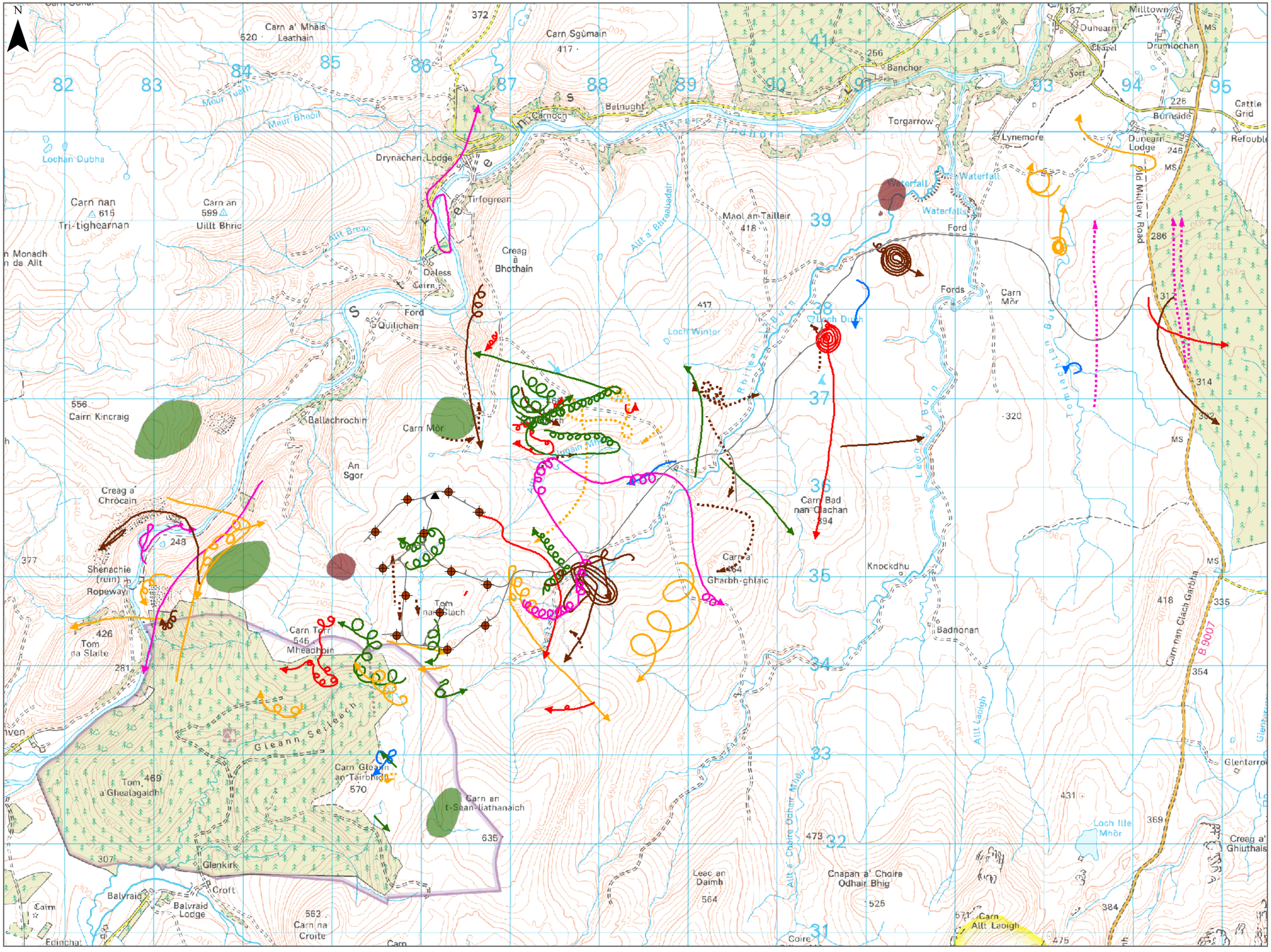
Flightline

- greylag goose
- pink-footed goose
- unidentified goose

Title: Goose flightlines from GVP & MWP surveys	
Project: Tom nan Clach Wind Farm Repowering	
Source: © Crown copyright and database rights 2015. Ordnance Survey 0100031673	
Client: Infinergy	
Drawn by: FL	**Checked:** DS
Date: 17/08/2015	**Figure:** 8.4
Scale: 0 0.2 0.4 km	**Revision No:** 3

INFINERGY

INFINERGY



Legend:

- Proposed turbine
- Access track
- Met mast
- golden eagle
- hen harrier
- red kite
- merlin
- osprey
- peregrine
- short-eared owl
- greylag goose
- pink-footed goose
- curlew
- golden plover

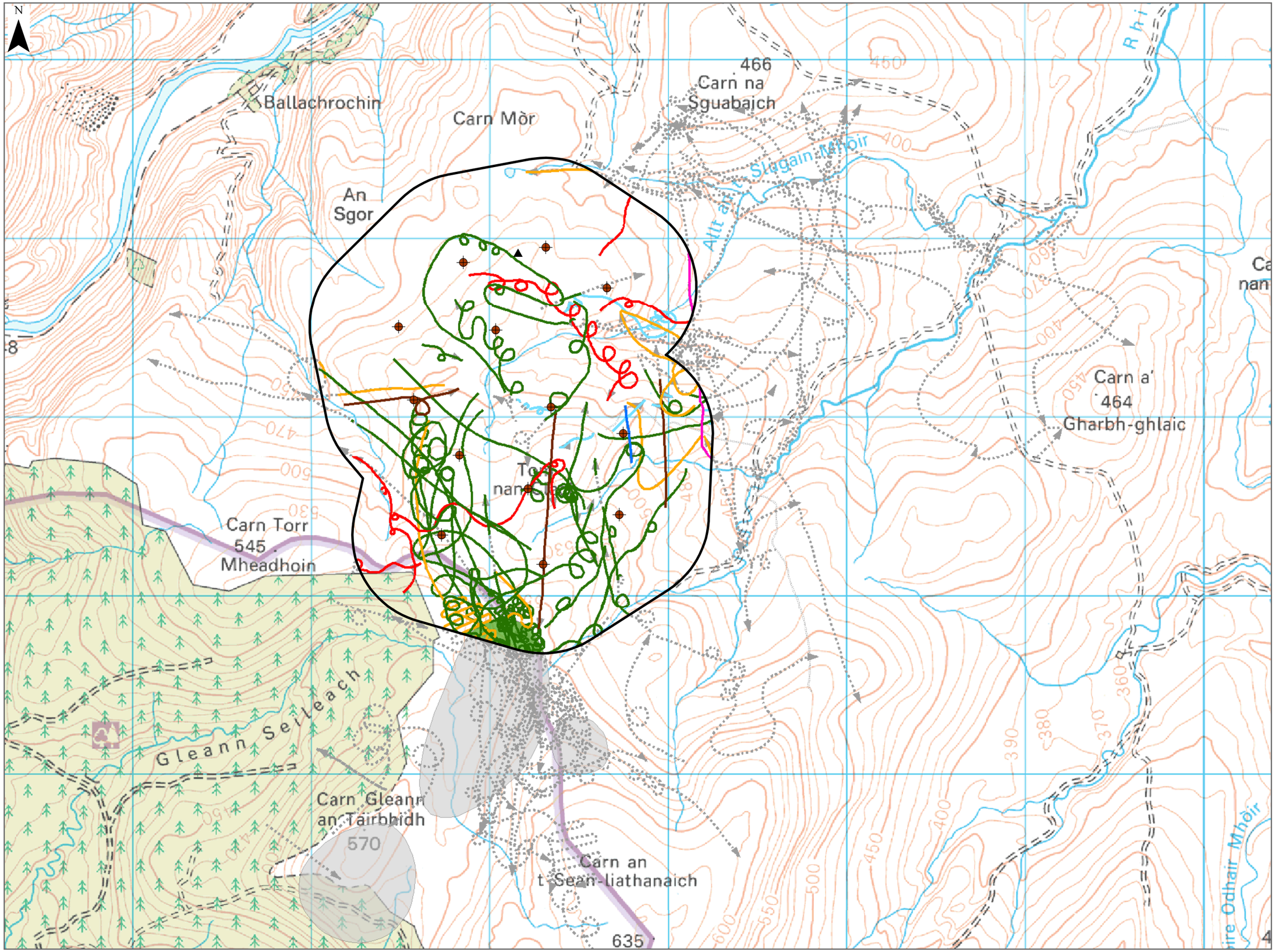
Flight areas

- curlew
- red kite

Title: Flights recorded during other surveys	
Project: Tom nan Clach Wind Farm Repowering	
Source:	
Client: Infinergy	
Drawn by: FL	**Checked:** DS
Date: 17/08/2015	**Figure:** 8.5
Scale: 0 0.4 0.8 km	**Revision No:** 3

INFINERGY

INFINERGY



Legend:

- Proposed turbine
- 500 m reporting buffer
- Met mast

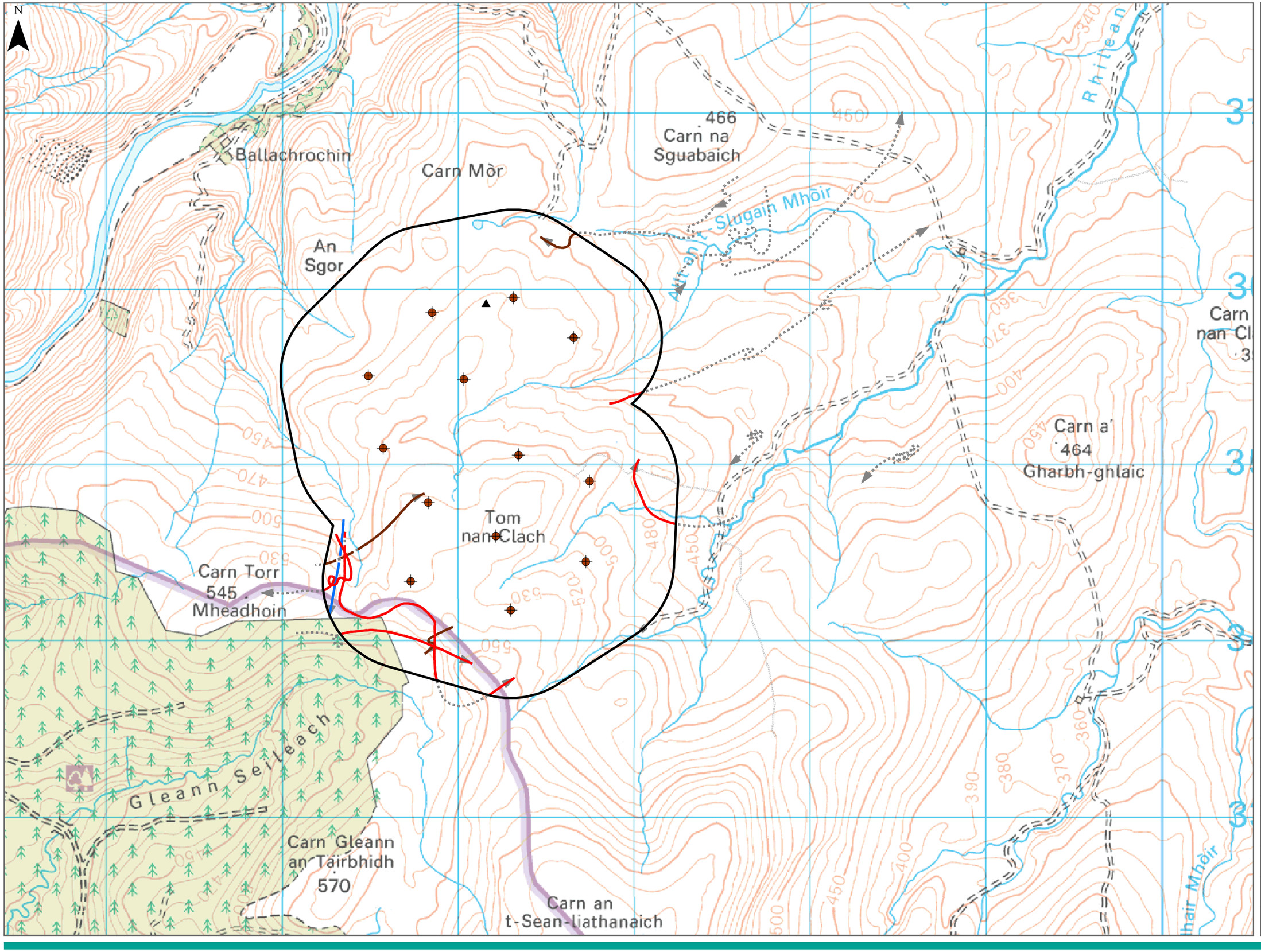
flight line

- golden eagle
- hen harrier
- red kite
- merlin
- osprey
- peregrine
- short-eared owl
- red kite flight area
- flight outwith parameters
- flightarea outwith parameters

Title:	Raptor flightlines from GVPs breeding season 2014 & 2015
Project:	Tom nan Clach Wind Farm Repowering
Source:	© Crown copyright and database rights 2015. Ordnance Survey 0100031673
Client:	Infinergy
Drawn by: FL	**Checked:** DS
Date: 17/08/2015	**Figure:** 8.6
Scale: 0 0.2 0.4 km	**Revision No:** 3

INFINERGY

INFINERGY



Legend:

- Proposed turbine
- 500 m reporting buffer
- Met mast

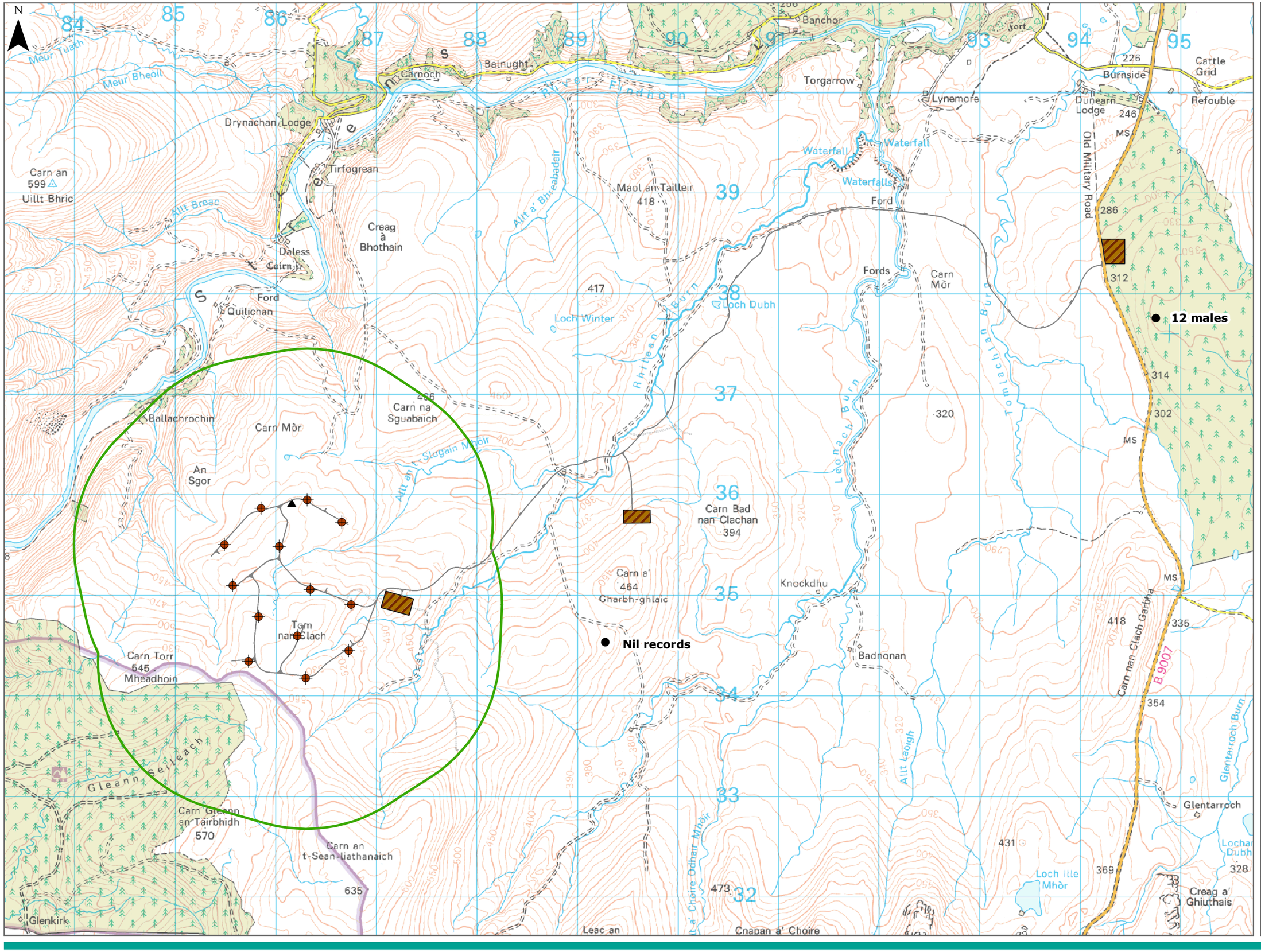
flight line

- hen harrier
- red kite
- merlin
- peregrine
- flight outwith parameters

Title: Raptor flightlines from GVPs non-breeding season 2014-2015	
Project: Tom nan Clach Wind Farm Repowering	
Source:	
Client: Infinergy	
Drawn by: FL	**Checked:** DS
Date: 17/08/2015	**Figure:** 8.7
Scale: 0 0.2 0.4 km	**Revision No:** 3

INFINERGY

INFINERGY



Legend:

- Proposed turbine
- Access track
- Borrow pit
- Met mast
- 1.5 km reporting buffer
- Location checked

Title:	Black grouse lek search results
Project:	Tom nan Clach Wind Farm Repowering
Source:	© Crown copyright and database rights 2015. Ordnance Survey 0100031673
Client:	Infinergy
Drawn by: FL	**Checked:** DS
Date: 17/08/2015	**Figure:** 8.8
Scale: 0 0.3 0.6 km	**Revision No:** 3

INFINERGY

Legend:

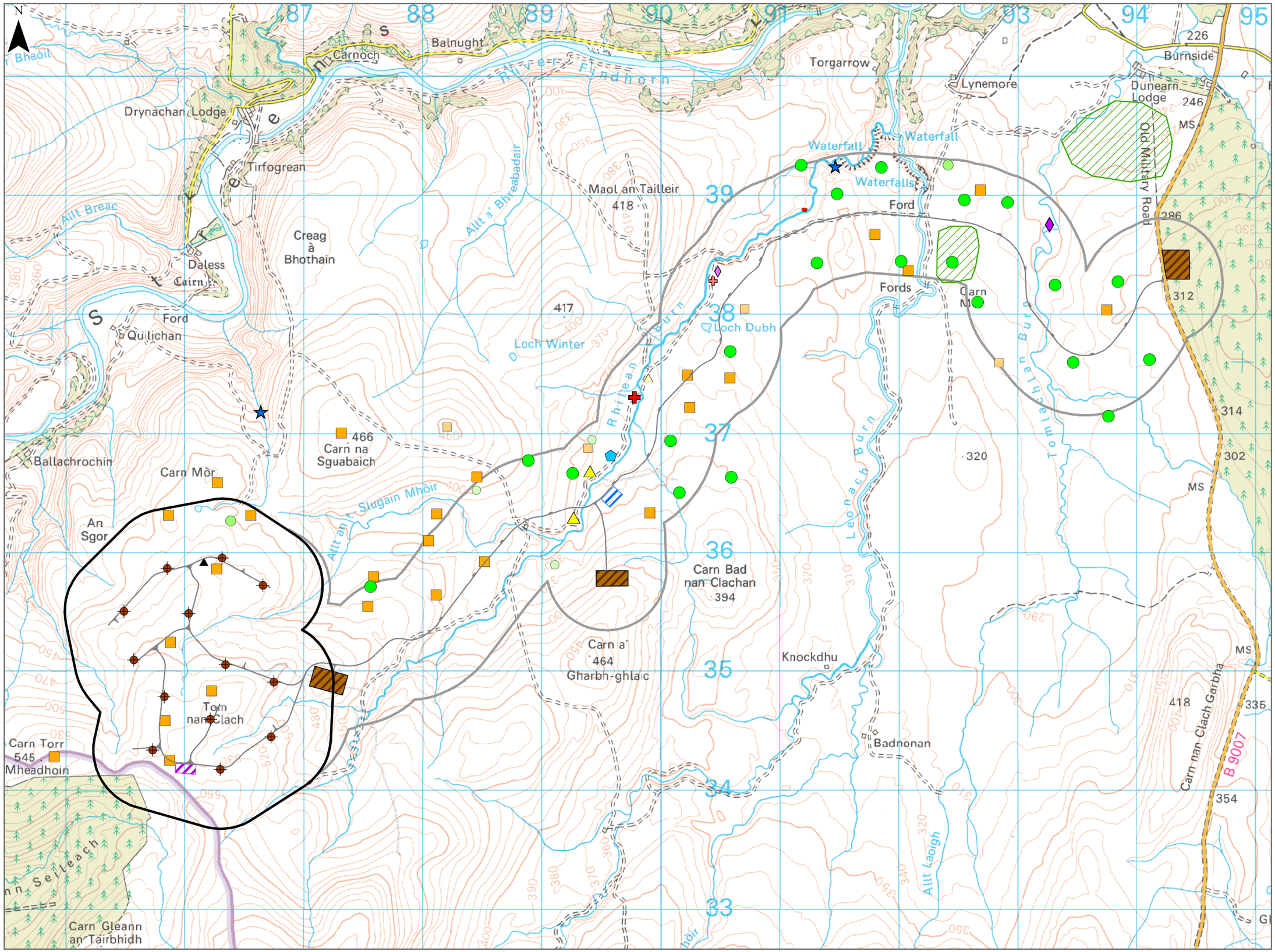
- Proposed turbine
- 500 m reporting buffer
- Met mast

flight line

- curlew
- golden plover

Title: Wader flights from GVPs	
Project: Tom nan Clach Wind Farm Repowering	
Source:	
Client: Infinergy	
Drawn by: FL	**Checked:** DS
Date: 17/08/2015	**Figure:** 8.9
Scale: 0 0.2 0.4 km	**Revision No:** 3

INFINERGY



Legend:

- Proposed turbine
- Access track
- Substation
- Borrow pit
- Construction compound
- Met mast
- 500 m reporting buffer
- 500 m buffer of access track

Territory Centres

Species, Status

- common sandpiper, confirmed
- common sandpiper, probable
- curlew, confirmed
- curlew, probable
- curlew, possible
- golden plover, confirmed
- golden plover, possible
- kestrel, confirmed
- lapwing, confirmed
- lapwing, probable
- oystercatcher, confirmed
- snipe, confirmed
- snipe, probable

Colonies

- common gull
- sand martin

Title: Territory Centres derived from Breeding Bird Surveys 2014

Project: Tom nan Clach Wind Farm Repowering

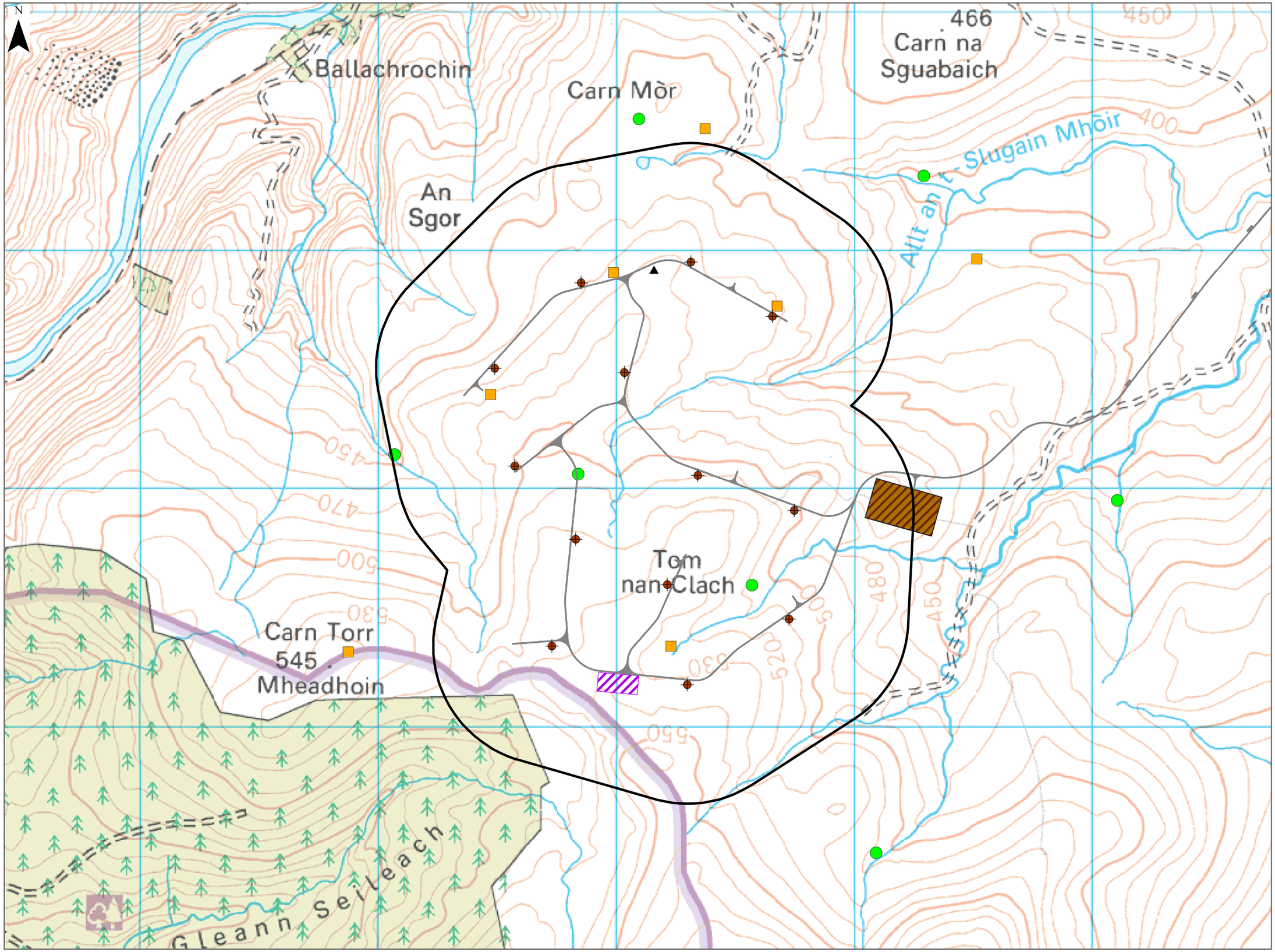
Source: © Crown copyright and database rights 2015. Ordnance Survey 0100031673

Client: Infinergy

Drawn by:	Checked:
FL	DS
Date: 17/08/2015	**Figure:** 8.10
Scale: 0 0.3 0.6 km	**Revision No:** 3

INFINERGY

INFINERGY



Legend:

- Proposed turbine
- 500 m reporting buffer
- Access track
- Substation
- Borrow pit
- Construction compound
- Met mast

Territory Centres

Species, Status

- curlew, confirmed
- golden plover, confirmed

Title:	Territory Centres derived from Breeding Bird Surveys 2015
Project:	Tom nan Clach Wind Farm Repowering
Source:	
Client:	Infinergy
Drawn by: FL	**Checked:** DS
Date: 17/08/2015	**Figure:** 8.11
Scale: 0 0.1 0.2 km	**Revision No:** 3

INFINERGY