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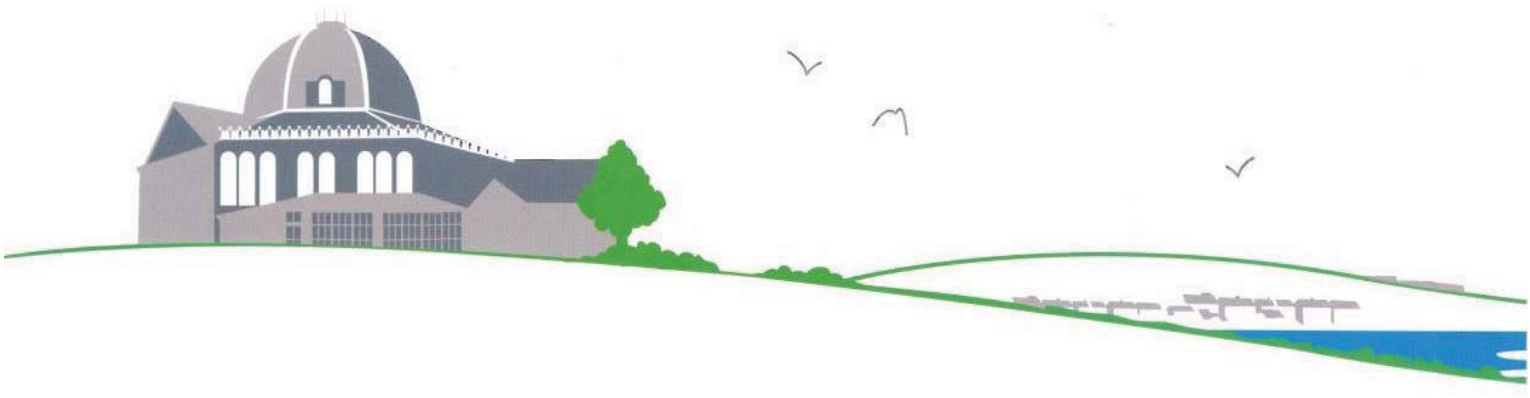
KEVIN BURNS

TRINAGLE FARM, THORNCLIFFE, STAFFORDSHIRE

VANTAGE POINT BIRD SURVEYS



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August 2013

This project has been undertaken in accordance with PAA policies and procedures on quality assurance.

Signed:_____

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1. INTRODUCTION

1.1 Penny Anderson Associates Ltd (PAA) was commissioned by Kevin Burns to undertake a Vantage Point (VP) bird survey at Triangle Farm, Thorncliffe, Staffordshire to support a planning application. It is proposed to construct a single 55kW wind turbine, of 34.6m tip height and 25m hub height, within an area of agricultural land to the east of Triangle Farm (SK 02668 59297), approximately 3km north-east of the town of Leek.

1.2 The development would require construction of a 6m x 6m concrete pad, which would then be partially buried, in order to anchor the turbine. A temporary 'floating road' would be laid over existing vegetation for the construction phase. No widening of the gateway access into the field is proposed. Cabling would be buried within an approximately 0.5m wide trench, which would be dug between the turbine location and the farm buildings.

1.3 Previous ecological surveys of the site carried out by PAA included an Extended Phase 1 Habitat Survey in March 2012 (PAA 2012a) and an upland breeding bird survey in May - June 2012 (PAA 2012b).

1.4 The VP survey was commissioned, based on advice given by Natural England (NE), following discussions and a site meeting held at Slate House Farm and Triangle Farm in November 2012. The survey was requested due to ongoing concerns over the potential collision risk posed by the proposed turbine to short-eared owls (a pair was recorded breeding in Unit 211 of the Leek Moors SSSI, to the north-west of Triangle Farm, in 2012).

1.5 This report describes the methodology applied in undertaking the VP survey and describes the flight-lines of the bird species using the area that are considered vulnerable to collision with wind turbines. The overall aim of the report is to assess the significance of the proposal in respect of the South Pennines SPA and constituent SSSI.

2. LEGISLATION RELATING TO BIRDS

2.1 Many of the bird species which may reasonably be expected to occur within the habitats present on and around the site and survey area are protected through various European and United Kingdom legislation, Biodiversity Action Plans and other conservation listings. The following is a summary of the relevant legislation and conservation listings.

EU Birds Directive

2.2 Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (this is the codified version of Directive 79/409/EEC as amended) is the EU's oldest piece of nature legislation and one of the most important, creating a comprehensive scheme of protection for all wild bird species naturally occurring in the Union. It was adopted unanimously by the Members States in 1979 as a response to increasing concern about the declines in Europe's wild bird populations resulting from pollution and loss of habitats as well as unsustainable use. It was also in recognition that wild birds, many of which are migratory, are a shared heritage of the Member States and that their effective conservation required international co-operation.

2.3 The directive recognises that habitat loss and degradation are the most serious threats to the conservation of wild birds. It therefore places great emphasis on the protection of habitats for endangered as well as migratory species (listed in Annex I), especially through the establishment of a coherent network of Special Protection Areas (SPAs) comprising all the most suitable territories for these species. Since 1994 all SPAs form an integral part of the Natura 2000 ecological network

2.4 The Birds Directive bans activities that directly threaten birds, such as the deliberate killing or capture of birds, the destruction of their nests and taking of their eggs, and associated activities such as trading in live or dead birds, with a few exceptions (listed in Annex III - III/1 allows taking in all Member States; III/2 allows taking in Member States in agreement with European Commission).

EU Habitats Directive

2.5 The Habitats Directive 92/43/EEC was adopted in 1992. The main aim of this Directive is to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements. While the Directive makes a contribution to the general objective of sustainable development, it ensures the conservation of a wide range of rare, threatened or endemic species, including around 450 animals and 500 plants. Some 200 rare and characteristic habitat types are also targeted for conservation in their own right.

2.6 The Directive provides for a ban on the downgrading of breeding and resting places for certain strictly protected animal species. Exceptions to the strict protection rules can be granted under very specific conditions. The Habitats Directive also establishes the EU wide Natura 2000 ecological network of protected areas. For these areas it provides a high level of safeguards against potentially damaging developments. Together with the Birds Directive, the Habitats Directive forms the backbone of EU nature protection legislation.

Wildlife and Countryside Act

2.7 All wild species of breeding birds and their nests are protected under Part 1 of the Wildlife and Countryside Act (WCA) 1981, as amended by later legislation including the Countryside and Rights of Way (CRoW) Act 2000. This legislation applies in England and Wales.

2.8 Part 1 (Section 1:1) of the WCA states that:

'If any person intentionally,

(a) kills, injures or takes any wild bird;

(b) takes, damages or destroys the nest of any wild bird while that nest is in use or being built; or

(c) takes or destroys an egg of any wild bird,

he shall be guilty of an offence.'

2.9 Part 1 (Section 1:5) of the WCA (amended by the CRoW Act 2000) refers to specific birds listed on Schedule 1 of the WCA, and states that:

'If any person intentionally or recklessly,

(a) disturbs any wild bird included in Schedule 1 while it is building a nest or is in, on or near a nest containing eggs or young; or

(b) disturbs dependent young of such a bird,

he shall be guilty of an offence and liable to a special penalty.'

2.10 Schedule 1 includes birds such as hen harrier (*Circus cyaneus*), merlin (*Falco columbarius*) and peregrine (*Falco peregrinus*). Please refer to the WCA for a complete list of Schedule 1 species.

2.11 Some provisions are made to allow the killing and taking of certain species under certain circumstances, as follows:

- Birds listed on Schedule 2 (Part 1) of the Act may be taken or killed outside of the 'close season' for each individual species (the 'close season' is defined by the Act). This includes various wild duck and geese species.

- Birds listed on Schedule 2 (Part 2) of the Act may be killed or taken by authorised persons at all times. This includes species such as carrion crow (*Corvus corone*), magpie (*Pica pica*), feral pigeon (*Columba livia*) and Canada goose (*Branta candadensis*). An 'authorised person' is defined as a person who has written authorisation to undertake the act from the relevant statutory authority. The written authority is in the form of a licence, either a general licence which covers a number of the more typical 'pest' species, or an individual licence for other individual species. In England these licences are issued by NE and in Wales by the Welsh Assembly Government.

Birds of Conservation Concern 2009

2.12 "Birds of Conservation Concern 3" (Eaton *et al.* 2009) quantifies the population status of 246 species of bird that breed regularly in the United Kingdom. The species have been reviewed against objective criteria and placed upon one of "three lists green, amber and red indicating an increasing level of conservation concern". Eaton *et al.* (2009) provides a full description of the criteria used for inclusion and the species on each of the lists. In summary, they are:

- Red list species are those that are Globally Threatened according to IUCN criteria; those whose population or range has declined rapidly in recent years; and those that have declined historically and not shown a substantial recovery;

- Amber list species are those with an unfavourable conservation status in Europe; species whose population or range has declined moderately in recent years; those whose population has declined historically but made a substantial recent recovery; rare breeders; and those with internationally important or localized populations; and,

- Species that fulfil none of the above criteria are green listed. These species are not included in the evaluation.

2.13 The population status of birds is reviewed every five years to keep track of changes in abundance and range. The new lists are based on the most up-to-date information available.

Local and UK Biodiversity Action Plan (LBAP and UKBAP) Species

2.14 These are bird species of conservation concern which have been elected as priority species following evaluation of changes in populations and distributions. An action plan for each species meeting the criteria was developed to set specific, measurable, achievable, realistic and time-bounded targets for the species concerned. Each plan was costed and then finalized by consensus across the full range of statutory and non-statutory organizations represented on the UK Biodiversity Group. The BAP identified the work that is necessary to improve the adverse status of these species.

2.15 The UK Biodiversity Group has agreed that the following principles apply to each priority species.

- each species should be the subject of targeted action;

- action for any species should be framed within either a dedicated action plan or a conservation statement;

- species which have not been recorded for the last 10 years should have a conservation statement, making search for that species the key requirement. If found as a result of this search, the species will then be subject to an action plan; and,

- species whose conservation needs may be delivered through existing habitat or species action plans, or those in preparation, should have a conservation statement, making the link to the related plan and setting biological targets for that species.

2.16 The *UK Post-2010 Biodiversity Framework* now succeeds the UKBAP, with work focused at the country level rather than the UK level. The lists of priority species and habitats from the UK BAP

continue to underpin biodiversity work in the countries. These are detailed in the *Species and Habitats Review Report* (Biodiversity Reporting and Information Group 2007).

Please note: the above text provides a brief summary of the legislation and policies with regard to breeding birds in England and Wales and the original Acts, subsequent amendments and documents referenced should be referred to for the precise wording.

3. METHODOLOGIES

Desk Study

3.1 Statutory and non-statutory authorities were contacted by PAA to gather local and site-specific ecological information. The desk study enables the proposed development site to be placed within a wider ecological context. The search zone encompassed a 2km radius from the centre of the site.

3.2 The Multi-Agency Geographic Information for the Countryside (MAGIC) website was queried for information on statutorily protected sites, such as SPAs, Special Areas of Conservation (SAC) and Sites of Special Scientific Interest (SSSI) with specific reference to their bird populations.

3.3 Staffordshire Ecological Record (SER) was consulted in 2012 to obtain records of birds and the location of any non-statutory protected sites. Data on the distribution of short-eared owls within the wider area were also sought from the Peak District National Park Authority (PDNPA) in 2013. In 2013 PAA was involved in the South-West Peak Wader Survey (SWPWS), a survey of upland-breeding wader populations in the south-west Peak District in April to July 2013. A number of short-eared owl records were collected incidentally during this survey and these have been reproduced here with the kind permission of Tara Challoner, the Peak District Wader Recovery Officer.

3.4 It is important to note that desk study results provide a historical record of the species present in and around the site and do not confirm current presence or absence of any particular species.

Vantage Point Survey

3.5 Currently little specific guidance is available on bird surveys for single small to medium sized turbines such as the 55kW Endurance model proposed at Triangle Farm. Consequently, the survey approach was based upon the latest guidance for wind farms published by NE and Scottish Natural Heritage (SNH) (NE 2010 and SNH 2010), and on the results of our 2012 upland bird survey (PAA 2012b).

3.6 VP surveys focus on recording the flights of target species through the area that would be occupied by wind turbines. Target species are protected species and others of conservation concern which, as a result of their flight patterns or response behaviour, are more likely to be subject to impact from wind turbines. In response to the concerns raised by NE, the methodology was tailored to focus on detecting short-eared owls should they be using the area, although all raptors and upland waders were recorded as target species. Summaries of the activity of secondary species (all birds outwith the definition of a target species) were also recorded.

3.7 On the basis of the guidelines set out in SNH (2010), 36 hours of total observation in the short-eared owl breeding season, approximately mid-April until mid-July (Hardey *et al.* 2009), was considered appropriate to the scale of the proposed development. Individual watches comprised two hours, in agreement with current NE guidance (NE 2010).

3.8 Watches took place from a single fixed VP (SK 02850 59361, Figure 3) that allowed observation of the turbine site and a 100m buffer zone. This enabled a confident assessment of bird flight lines through the theoretical rotor-swept area (10m radius of the mast) of the proposed turbine. As short-eared owl was the main target species for the survey, watches were

targeted during times that increased the chances of this species being detected. Timing of the watches was therefore based on survey guidance presented by Hardey *et al.* (2009) who suggest that, during the incubation period (mid-April to May), the best time for visits is in the four hours before dark, whilst during the chick-rearing period (June) birds are more visible and visits in the morning or early evening are recommended. In July, when most broods fledge, the adults are more active in the mornings and, therefore, watches were targeted at this time of day.

3.9 Watches were not restricted to periods of fine weather only and a wide range of conditions were sampled in case the behaviour of target species altered in response to weather, for example high winds, rainfall and low visibility. Periods of clear weather after rainy spells (e.g. sunshine and showers) were also targeted, as short-eared owl activity is likely to be increased under these conditions (Hardy *et al.* 2009). The VP survey schedule is provided in Table 1.

Table 1 Timing and Number of Watches

Survey period	Number of weeks	Number of VP watches
Mid-April to June	7	9
June	4	6
Mid-July	3	3

3.10 VP surveys are a means of recording flight activity of bird species within a wind farm envelope, with the principal aim of quantifying the collision risk posed to target species. Activity patterns and time spent flying within the turbine envelope may also enable an assessment of the consequence of displacement of birds, post construction.

3.11 During each watch two hierarchical recording methods were used: focal sampling for target species and activity summaries for secondary species.

3.12 Focal sampling involved scanning the survey area until a target species was detected and following it until it had ceased flying or was lost from view. The time of detection, the flight duration and activity and number of birds were recorded. Flight direction and height were estimated at 15 second intervals and plotted on to an aerial photograph of the site, showing the turbine location and 10m and 100m buffer zones. Flight height was estimated in bands, reflecting the blade diameter of the proposed turbine (<15m, 15-35m, >35m) so that time spent flying within the rotor-swept area could be assessed.

3.13 Activity summaries for secondary species were compiled for every ten minute period of each two-hour watch. Observation of target species took precedence over recording of secondary species such that, if a target species was being followed at the end of a ten minute period, the activity summary for that period was abandoned.

3.14 The survey work was undertaken by the following staff from Penny Anderson Associates:

- Alistair Blackshaw (Senior Ecologist MCIEEM); and
- Chloe Pritchard (Senior Ecologist MCIEEM).

Limitations and Deviations from the Methodology

3.15 No limiting circumstances were encountered during the survey.

3.16 SNH (2010) recommends surveys retain a degree of flexibility due to the possibility of unforeseen circumstances arising, such as greater than expected use of the site by a target species, during the survey period. In order to account for an increased number of incidental observations of target raptors within the wider area during late June, it was decided to replace one of the morning visits scheduled for July with an evening visit.

4. RESULTS

Desk Study

Statutory Protected Sites

4.1 Four statutory protected sites lie within 2km of the proposed turbine location.

South Pennine Moors Special Protection Area (SPA)

4.2 Part of the South Pennine Moors SPA lies approximately 215m to the north-east of the proposed turbine location. This is the southern most unit of the Leek Moors SSSI, which covers an area of approximately 66,000ha from Ilkley Moor in the north to the Leek Moors in the south.

4.3 This site qualifies under Article 4.1 of the Birds Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

4.4 During the breeding season:

- Golden plover (*Pluvialis apricaria*), 752 pairs representing at least 3.3% of the breeding population in Great Britain (count as at 1990);
- Merlin (*Falco columbarius*), 77 pairs representing at least 5.9% of the breeding population in Great Britain;
- Peregrine, 16 pairs representing at least 1.4% of the breeding population in Great Britain; and,
- Short-eared owl, 25 pairs representing at least 2.5% of the breeding population in Great Britain.

South Pennine Moors Special Area of Conservation (SAC)

4.5 The site also qualifies under Article 4.2 of the Bird's Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

4.6 During the breeding season:

- Dunlin (*Calidris alpina schinzii*), 140 pairs representing at least 1.3% of the breeding Baltic/UK/Ireland population.

4.7 Part of the South Pennine Moors SAC (also unit 211 of the Leek Moors SSSI) lies approximately 215m to the north-east of the proposed turbine location. This is the southern-most unit of the site, and part of the Leek Moors SSSI, which covers an area of approximately 65,000ha from Ilkley Moor in the north to the Leek Moors in the south.

4.8 The site is designated for its habitats of European importance including a range of dry heath communities, impoverished blanket bogs and sessile oak (*Quercus petraea*) woodlands along with wet heath and transition mires.

Leek Moors SSSI

4.9 Unit 211 of the Leek Moors SSSI lies approximately 215m to the north-east of the proposed turbine location. The SSSI is subsumed within the above described European sites due to its bird and vegetation interest features.

4.10 More specifically, the Leek Moors SSSI comprises an extensive tract of semi-natural upland and upland fringe vegetation, typical of the Southern Pennines, and supports several plants and animals at the southern limits of their English distribution. The primary habitat types of interest are blanket mire, dwarf shrub heath and unenclosed acidic grassland.

4.11 The mire communities of Axe Edge support a large, regionally significant population of golden plover and the wider site is of great importance for upland breeding birds including merlin and dunlin.

Thorncliffe Moor SSSI

4.12 Thorncliffe Moor lies approximately 200m to the south of the proposed turbine location. This site is outwith the European sites described above and the Leek Moors SSSI. The site is designated for its extensive spring-fed fens which are the largest and most floristically diverse examples known of their type in Staffordshire and are uncommon within the western Peak District. In addition, dwarf shrub heath and acidic grassland communities are also present.

Protected Bird Species

4.13 A large quantity of data relating to birds was received from SER. These data include records of many common and widespread species which would not be considered in this assessment due to their low sensitivity and/or conservation status. The entire dataset is presented in PAA (2012b). Appendix I presents the records of target species provided by SER.

SPA Species

Short-eared Owl

4.14 SER provided 21 records of short-eared owl between 1988 and 2011. The PDNPA provided a further 268 records of this species within the Peak District, although none of these was within 2km of the proposed turbine. All of these records have been supplemented by data gathered by PAA in 2013, as part of the SWPWS, and are presented in Figures 1 and 2.

Other Raptors

4.15 SER provided five records of hen harrier (2005-2008), five records of merlin (2005-2010) and three records of peregrine (2005-2011) within 2km of the proposed turbine.

Waders

4.16 A total of six records of golden plover between 2003 and 2010 were provided by SER.

Non-SPA Species

Raptors

4.17 The most numerous raptor in the SER data was kestrel with 22 records between 1978 and 2011. SER also provided 14 records of buzzard (2000-2011), seven records of barn owl, two records of little owl and one record of marsh harrier.

Waders

4.18 SER provided 24 records of lapwing (1972-2011), 22 records of curlew (1978-2011) and 21 records of snipe (1972-2010).

Vantage Point Survey

4.19 Surveys were carried out around dusk and dawn in generally dry weather conditions and an average temperature of 10ºC. Wind speeds varied throughout the survey period, being generally higher in April and May and slightly lower in June and July. A detailed summary of the weather conditions for each visit is presented in Appendix II.

4.20 A total of 25 bird species was recorded, comprising 6 target species and 18 secondary species. These are summarised in Table 2 with the full target species data and summary counts of secondary species presented in Appendices III and IV respectively.

Table 2 Species Recorded During the VP Survey and their Conservation Status (Eaton et al., 2009; Biodiversity Reporting and Information Group 2007)

Species Common Name	Species Latin Name	Number of Registrations	Conservation Status
Target Species			
Buzzard	*Buteo buteo*	2	Green List
Curlew	*Numenius arquata*	25	UKBAP, Amber List
Golden plover	*Pluvialis apricaria*	2	Amber List
Kestrel	*Falco tinnunculus*	2	Amber List
Short-eared owl	*Asio flammeus*	3	Amber List
Snipe	*Galinago galinago*	10	Amber List
Secondary Species			
Blackbird	*Turdus merula*	3	Green List
Canada goose	*Branta canadensis*	3	
Carrion crow	*Corvus corone*	104	Green List
Goldfinch	*Carduelis carduelis*	1	Green List
Jackdaw	*Corvus monedula*	2	Green List
Lesser black-backed gull	*Larus fuscus*	30	Amber List
Linnet	*Carduelis cabaret*	3	UKBAP, Red List
Meadow pipit	*Anthus pratensis*	115	Amber List
Pheasant	*Phasianus colchicus*	2	Green List
Pied wagtail	*Motacilla alba*	4	Green List
Raven	*Corvus corax*	2	Green List
Reed bunting	*Emberiza schoeniclus*	3	UKBAP, Amber List
Rook	*Corvus frugilegus*	72	Green List

Species Common Name	Species Latin Name	Number of Registrations	Conservation Status
Skylark	*Alauda arvensis*	67	UKBAP, Red List
Starling	*Sturnus vulgaris*	332	UKBAP, Red List
Stock dove	*Columba livia*	2	Amber List
Swallow	*Hirundo rustica*	22	Amber List
Swift	*Apus apus*	53	Amber List

Target Species

4.21 A total of 44 registrations of target species were recorded during the survey, an average of 1.2 registrations per two-hour watch (Figure 3). Curlew[1] accounted for the majority of registrations with 14 flight records and 11 records of birds calling from the ground. Snipe were the second most numerous target species with five flight records and five records of birds calling from the ground. A short-eared owl was seen on one occasion, making three flights through the survey area.

4.22 No target species flew through the turbine collision zone. The majority of target species' flight activity was concentrated within the rush-pastures to the east and the north of Triangle Farm and mainly comprised commuting and display flights by curlew. Accounts of the activity of the target species recorded are provided below and presented in Figures 4 - 9.

Buzzard

4.23 A Buzzard was recorded within the survey area on 29th June. It entered the area from Thorncliffe Moor SSSI and foraged over the large rush pasture field to the east of Triangle Farm before flying northwards.

Curlew

4.24 Curlews were recorded on 10 of the 18 survey visits and were the most active target species. Curlew activity was concentrated in the large rush pasture field to the east of Triangle Farm and within a similar field to the north of the Thorncliffe road. Curlews were observed displaying over both of these fields suggesting that they bred there during 2013, although no juvenile birds were seen. The majority of curlew flight activity over the eastern field was considered to be birds commuting to and from the field to forage and that a maximum of between one and two pairs would have bred here.

Golden Plover

4.25 Golden plovers were recorded on two occasions. Once flying low over the VP, to forage in the rush pasture to the east of Triangle Farm and once foraging in the same field for the duration of a survey visit.

[1] *Common names only are referred to in the text, please see Table 1 and Appendix IV for Latin names of species; nomenclature follows Dudley et al. 2006.*

Kestrel

4.26 Kestrels were recorded on two occasions. Once foraging over the rush-pasture to the east of Triangle Farm and once perched on a fence-post, on the south-western edge of the survey area.

Short-eared Owl

4.27 A short-eared owl was recorded on a single occasion. Initially, the bird flew directly over the VP and then northwards foraging over the road verge at a height of around 2m, before perching on a wall and leaving the survey area to the north-east after being disturbed by a passing car. The bird returned after two minutes, flying quickly over the rush-pasture to the east of Triangle Farm, and resumed foraging along the road verge to the south of the VP.

Snipe

4.28 Snipe were recorded on seven of the 18 survey visits in the rush pasture to the east of Triangle Farm; records were of chipping and drumming birds. The consistency of activity and distribution of registrations suggests that between one and two pairs of snipe bred in this field.

Secondary Species

4.29 The most frequently recorded secondary species were skylark, meadow pipit and carrion crow, which were recorded during every survey visit. Swallows were quite frequently recorded and it is considered likely a small population bred in the outbuildings at Triangle Farm, although they only seemed to forage over the survey area during periods of calmer weather. Swifts were generally infrequent although on 21st June, an evening with low wind speed and relatively high temperatures, a total of 49 birds were recorded foraging over the area. Starlings were also seen relatively infrequently but aggregations of up to 250 adult and juvenile birds were recorded towards the end of the survey foraging within recently mown fields.

5. DISCUSSION

5.1 Numerous studies have been undertaken to ascertain the likely and actual impacts of turbine/wind farm development upon birds and other species. Despite this, there is little information on the generality of impacts upon particular species (Pearce-Higgins *et al.* 2012). It must also be recognised that much of the research and information regarding the effects and impacts upon birds from wind farm development is derived from studies of multiple turbine "farms" incorporating large turbines rather than single smaller turbines for domestic use.

5.2 Drewitt and Langston (2006) state that "the effects of a wind farm on birds are highly variable and depend upon a wide range of factors including the specification of the turbines, the topography of the surrounding land, the habitats affected and the number and species of birds present". Whilst Pearce-Higgins *et al.* (2012) state that in their study "the impacts from wind farms were largely unaffected by technical specifications (turbine height, number and generating power) and are therefore widely applicable".

5.3 However, when extrapolating from the current literature and understanding, it should be recognised that scale *is* a determining factor when considering the potential impacts from the proposal at Triangle Farm.

5.4 It is recognised that there are four areas where impacts may be observed:

- Collision;
- Barrier effect;
- Displacement due to disturbance; and
- Habitat loss.

Collision

5.5 Direct mortality or lethal injury can result from collisions with rotors, towers, nacelles and associated structures, as well as from the effects of vortices created by the moving rotors (Drewitt and Langston 2006). Drewitt and Langston recognise that the majority of studies investigating collisions have found "relatively low levels of mortality" but highlight the fact that for birds of conservation concern and long-lived species even low levels can be significant.

5.6 No target species were recorded flying through the rotor-swept area of the proposed turbine and therefore the study provides evidence that it would pose a low overall risk to target species. It is, however, acknowledged that the risk of collision with target species cannot be fully ruled out but is considered, on the basis of this study, that one species - the curlew - would be at anything more than a negligible risk of occasional collisions with the turbine, due to their relatively high frequency of flights at potential collision height through the survey area. As the local landscape allows a clear line of sight to the turbine it is likely that any collisions would be most likely to take place during conditions of severely reduced visibility, which did not occur during the survey. It is considered that mortality resulting from any such collisions would not be at a sufficient level to cause a significant effect on the local population of curlew.

5.7 A short-eared owl was seen on a single occasion, foraging well below potential collision height at a distance of more than 125m from the proposed turbine location. The fact that this was the only record of the species in 36 hours of survey effort, targeted specifically at times when short-

eared owls were most likely to be active and within the breeding season, strongly suggests that short-eared owls are present within the vicinity of the proposed turbine only very infrequently. This is supported by the species' documented ecology, being found "*principally on upland heather moors*" (Brown and Grice 2005) and by desk study records (Figures 1 and 2), which show the survey area to be at the extreme south-westerly limit of the short-eared owl's distribution within the Peak District region. Despite being in relatively close proximity to areas of core moorland habitat, the survey area offers relatively little undisturbed good quality foraging habitat and, therefore, probably forms part of a more extensively used peripheral foraging area for short-eared owls. This conclusion is supported by the behaviour of the bird recorded during the survey, which selected the roadside verges (which are frequently disturbed by motorists) in preference to the relatively undisturbed rush pasture, as foraging habitat. As short-eared owls were so scarcely recorded within the survey area and no birds came close to the turbine it is considered that the collision risk it poses to this species would be negligible.

Habitat Loss

5.8 Habitat loss is not considered to be an issue at either the construction or operational phases. The development would require construction of a 6m x 6m concrete pad, which would be partially buried, in order to anchor the turbine. It is recommended that sufficiently sized turves are removed from the footprint and laid over the concrete base so that only a 2m x 2m footprint will be visible. This reduces habitat loss to a $4m^2$ area of grazed pasture.

5.9 A permanent surfaced access road is not proposed; however, if necessary, due to ground conditions, a temporary 'floating road' would be laid over existing vegetation. No widening of the gateway access into the field is proposed. Cabling would be buried within an approximately 0.5m wide trench, which would be dug between the turbine location and the farm buildings.

5.10 Working areas should be kept to the minimum required.

Displacement due to Disturbance

5.11 Pearce-Higgins *et al.,* (2012) found that curlew and snipe densities declined on wind farm sites during the construction phase and did not recover during the operational phase. The study concluded that results for breeding populations suggest that the main negative effects of wind farms may be through disturbance displacement during construction, although Yalden and Pearce-Higgins (1997) suggest that displaced individuals may not be lost to the breeding population and may simply breed elsewhere.

5.12 It is therefore important that the implementation of the proposal takes account of the potential for disturbance and takes measures to avoid or mitigate them. The potential for disturbance from this proposal is considered to be greatest at the construction phase, however, this disturbance is considered to be localised. Figure 10 identifies a zone of disturbance during constructions using contour lines and sight lines. When cross referenced with desk study data and the results of this survey, Figure 10 demonstrates that there is potential for disturbance of snipe and curlew if the turbine were constructed during the breeding season.

5.13 There are several studies which show that curlew, amongst other species, can suffer disturbance at up to 600m from even a small wind farm, and Winkelman 1992 found significantly smaller numbers of birds feeding and roosting when turbines were operational, with the effects being recorded at 500m from the turbines. Langston and Pullan (2003) state that "generally the studies show that breeding waders are not disturbed by the presence of turbines" but that this should be viewed with a little caution as it is not clear to what extent turbines deter new recruits to the wader breeding population.

5.14 It is, therefore, recommended that construction is undertaken outside the breeding bird season. During the winter months particularly, the habitats within the survey area and beyond would support fewer species and individuals at an arguably less critical time of the year.

Barrier Effect

5.15 The VP survey data show no movements of target species through the turbine location, and little flight activity recorded within the Triangle Farm land holding across the survey period. This suggests that barrier effects, whereby flyways are blocked or hindered by wind turbines, are not a consideration for this proposal. Whilst it is recognised that birds may alter their flight to avoid a turbine, it is considered that a small single turbine would not constitute a barrier to movement of any of the target species recorded during the survey. Cumulative effects of similar proposals that are in close proximity could result in a manifestation of this effect; however, at the current time the closest single turbine to the proposed site is *c.*2.5km to the south along the Blakelow Road.

6. CONCLUSIONS

6.1 The data collected during the VP survey suggest a single wind turbine in the proposed location would pose a low overall collision risk to target bird species, namely waders and raptors. The risks to the species recorded that are designated features of the South Pennines SPA, namely short-eared owl and golden plover, are considered to be negligible due to their scarcity of occurrence within close proximity to the turbine. On the basis of the data collected during the survey, no impacts on the South Pennines SPA or its constituent SSSI are anticipated.

6.2 Likely impacts arising from the proposal would be localised, occurring in the immediate locality of the proposed site at the construction stage, and would be limited to a small number of breeding wading birds, snipe and curlew. These effects would be adequately mitigated by constructing the turbine and any associated infrastructure outwith the bird breeding season, September to February inclusive. Operational impacts of the turbine would be adequately mitigated by carrying out scheduled maintenance outwith the bird breeding season, as specified above.

7. REFERENCES

Biodiversity Reporting and Information Group, 2007. *Species and Habitats Review Report.* http://jncc.defra.gov.uk/page-5706 accessed July 2013.

Brown, A. and Grice, P., 2005. *Birds in England*. Poyser.

Drewitt, A.A., and. Langston, R.H.W., 2006. *Assessing the impacts of wind farms on birds*. Ibis, **148**, 29-42.

Dudley, Steve, P., Gee, M., Kehoe, C., Melling, T. M. and the British Ornithological Union Records Committee, 2006. The British List: A Checklist of Birds in Britain (7th Edition). *Ibis*, **148**. 526-563.

Eaton, M. A., Brown, A.F., 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 the Isle of Man. *British Birds*, **102**, 296-341.

Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. and Thompson, D., 2009. *Raptors – A field guide for surveys and monitoring (Second Edition).* The Stationary Office.

Langston, R.G and Pullan, J.D., 2003. *Windfarms and Birds: an analysis of the effects of wind farms on birds and guidance on environmental impacts criteria and site selection issues*. Report written by Birdlife International on behalf of the Bern Convention. Council Europe Report T-PVS/Inf.

Natural England (NE), 2010. *Technical Information Note TIN069 - Assessing the effects of onshore wind farms on birds.* Natural England.

PAA, 2012a. *Triangle Farm Extended Phase 1 Habitat Survey*. Unpublished report to Kevin Burns.

PAA. 2012b. *Triangle Farm Upland Breeding Bird Survey*. Unpublished report to Kevin Burns.

Pearce-Higgins, J.W., Stephen, L., Douse, A., Langston, R.H.W., 2012. Greater impacts of windfarms on bird populations during construction than subsequent operation: results of a multi-site and multi species analysis. *Journal of Applied Ecology*, **49**, 386–394.

Scottish Natural Heritage, (SNH), 2010. *Survey Methods for use in Assessing the Impacts of Onshore Windfarms on Bird Communities*. Scottish Natural Heritage.

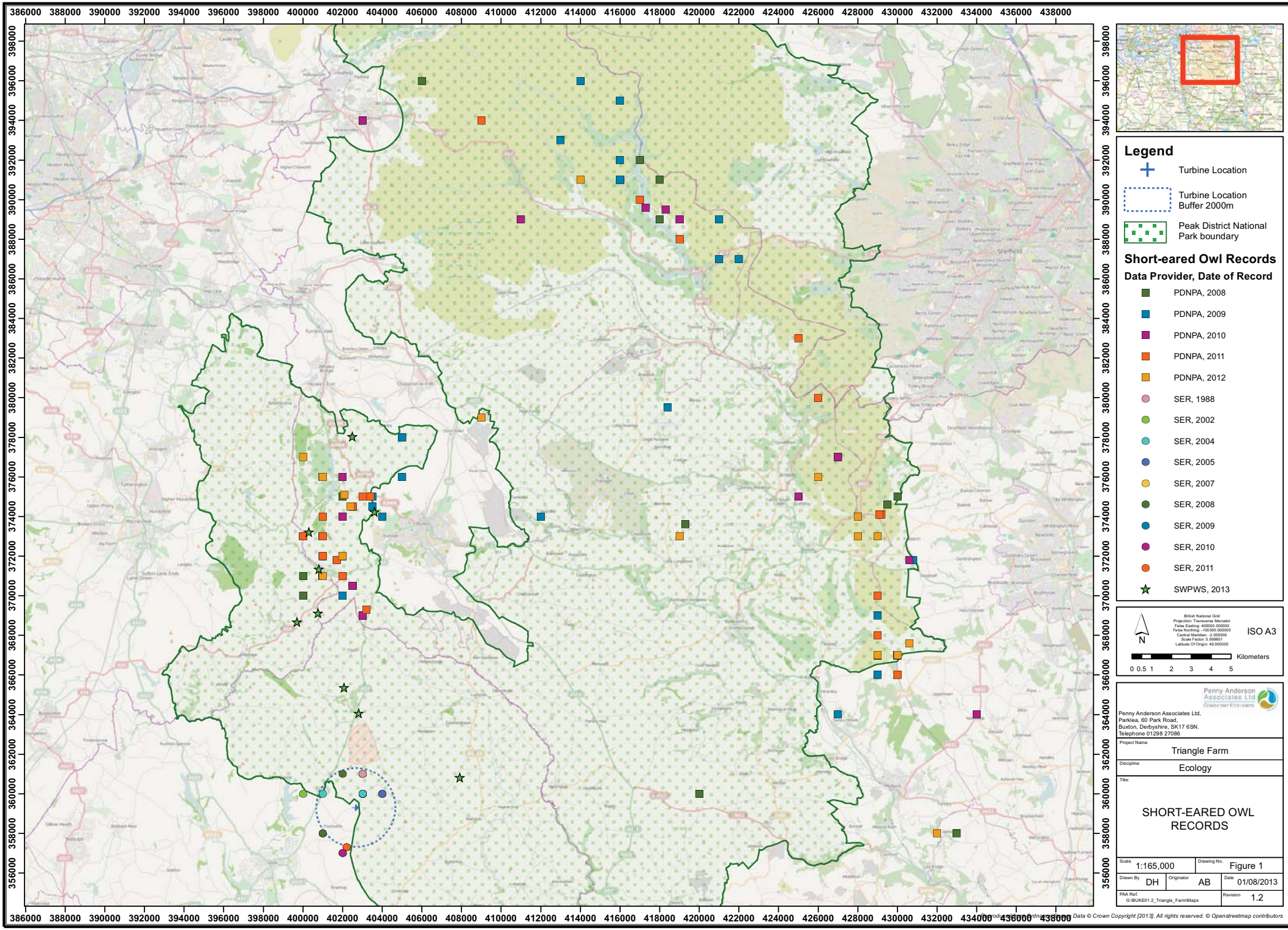
Scottish Natural Heritage, (SNH), 2006. *Assessing the Significance of Impacts from Offshore Windfarms on Birds Outwith Designated Areas*. Scottish Natural Heritage.

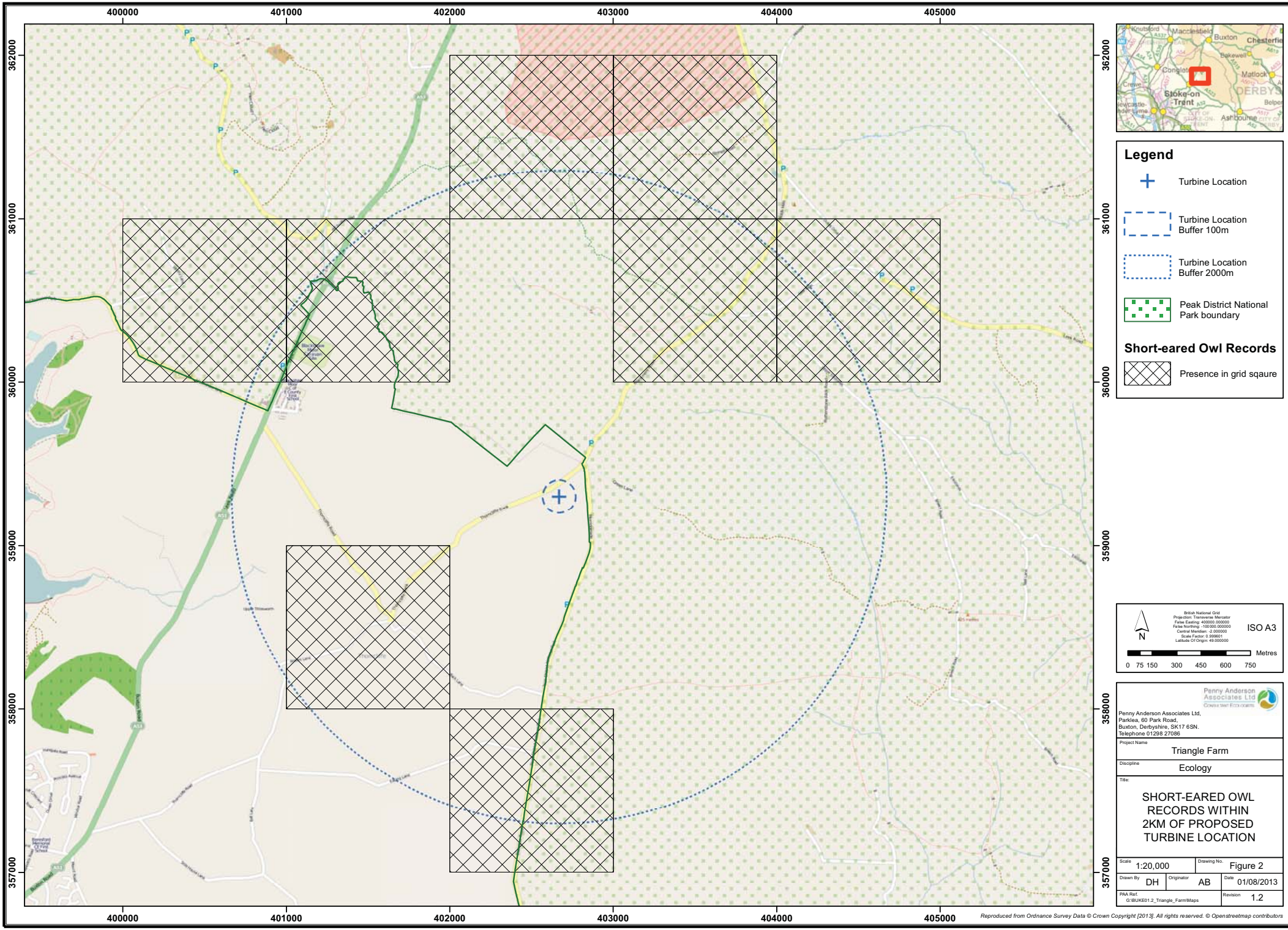
Winkelman, J.E., 1992b. *The Impact of Sep Wind park near Oosterbierum (Fr), the Netherlands, on Birds 2: nocturnal collisions risks. RIN-rapport 92/3* – DLO- Instituut Voor Bos-en Natuuronderzoek.

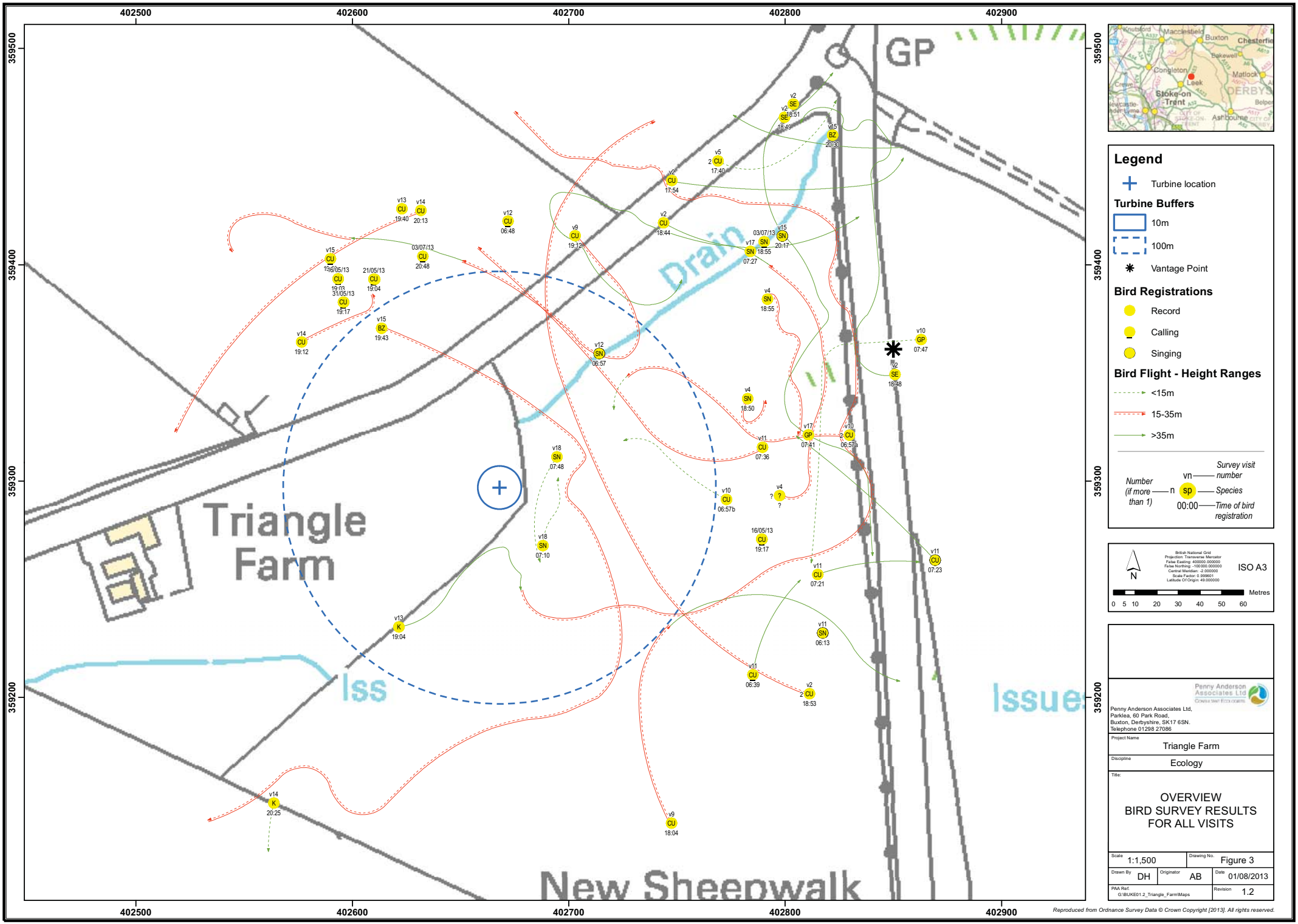
Winkelman, J.E., 1992d. *The Impact of Sep Wind park near Oosterbierum (Fr), the Netherlands, on Birds 2: disturbance. RIN-rapport 92/5* – DLO- Instituut Voor Bos-en Natuuronderzoek.

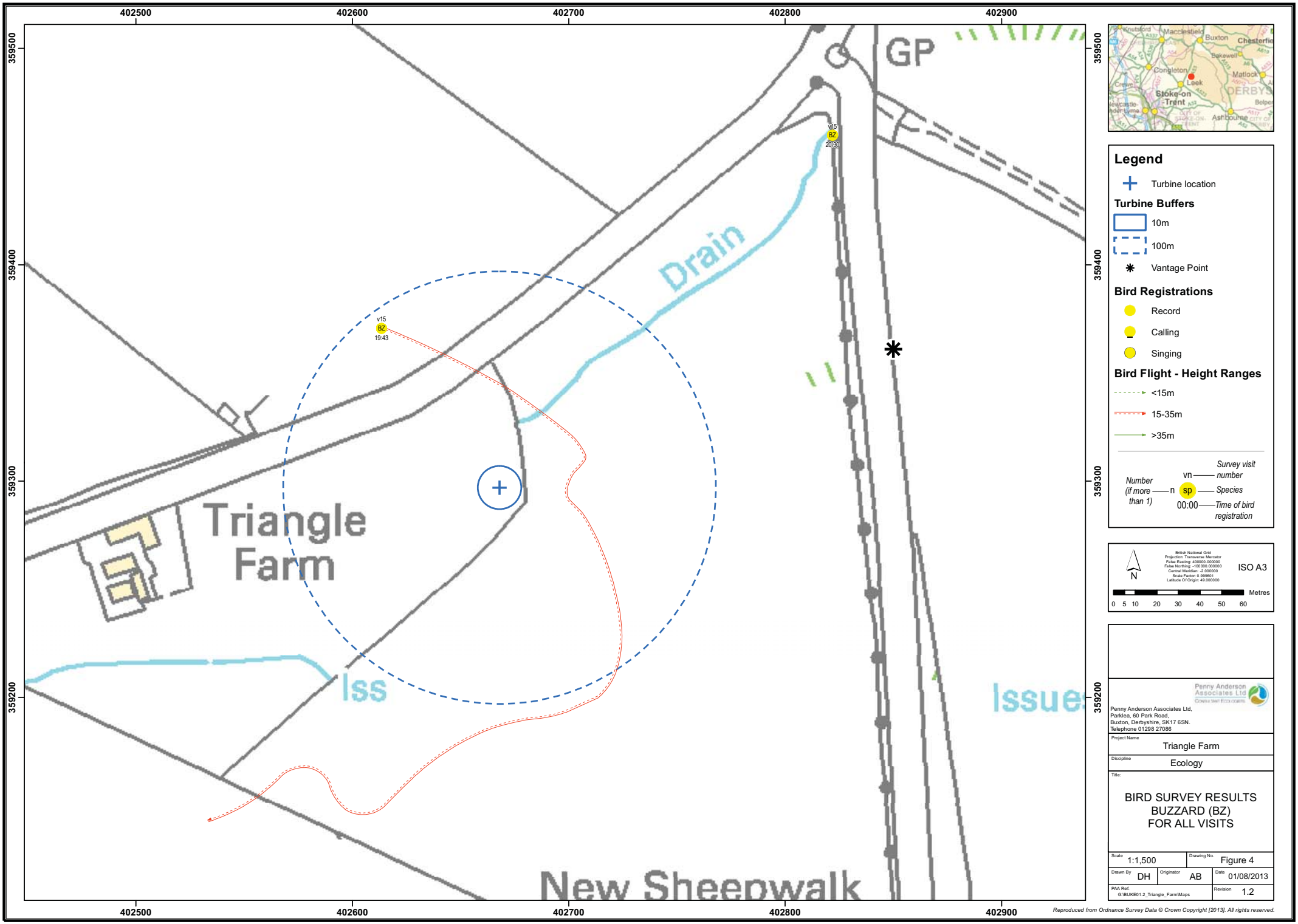
Yalden, D.W. and Pearce-Higgins, J.W., 1997. Density-dependence and winter weather as factors affecting the size of a population of Golden plovers Pluvialis apricaria. *Bird Study*, **44**, 227-234.

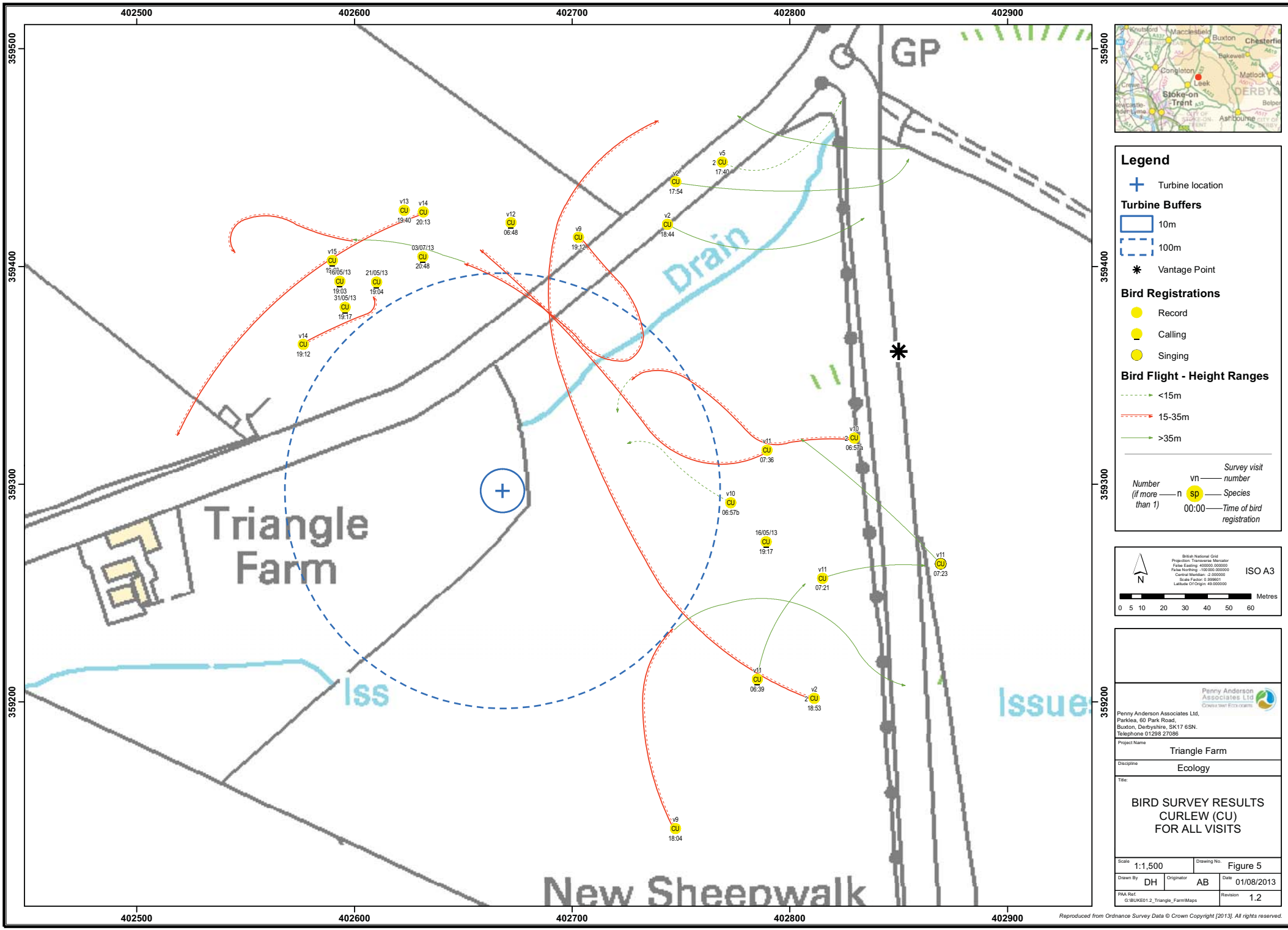
FIGURES











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Discipline: Ecology

Title:

BIRD SURVEY RESULTS CURLEW (CU) FOR ALL VISITS

Scale: 1:1,500		Drawing No.: Figure 5	
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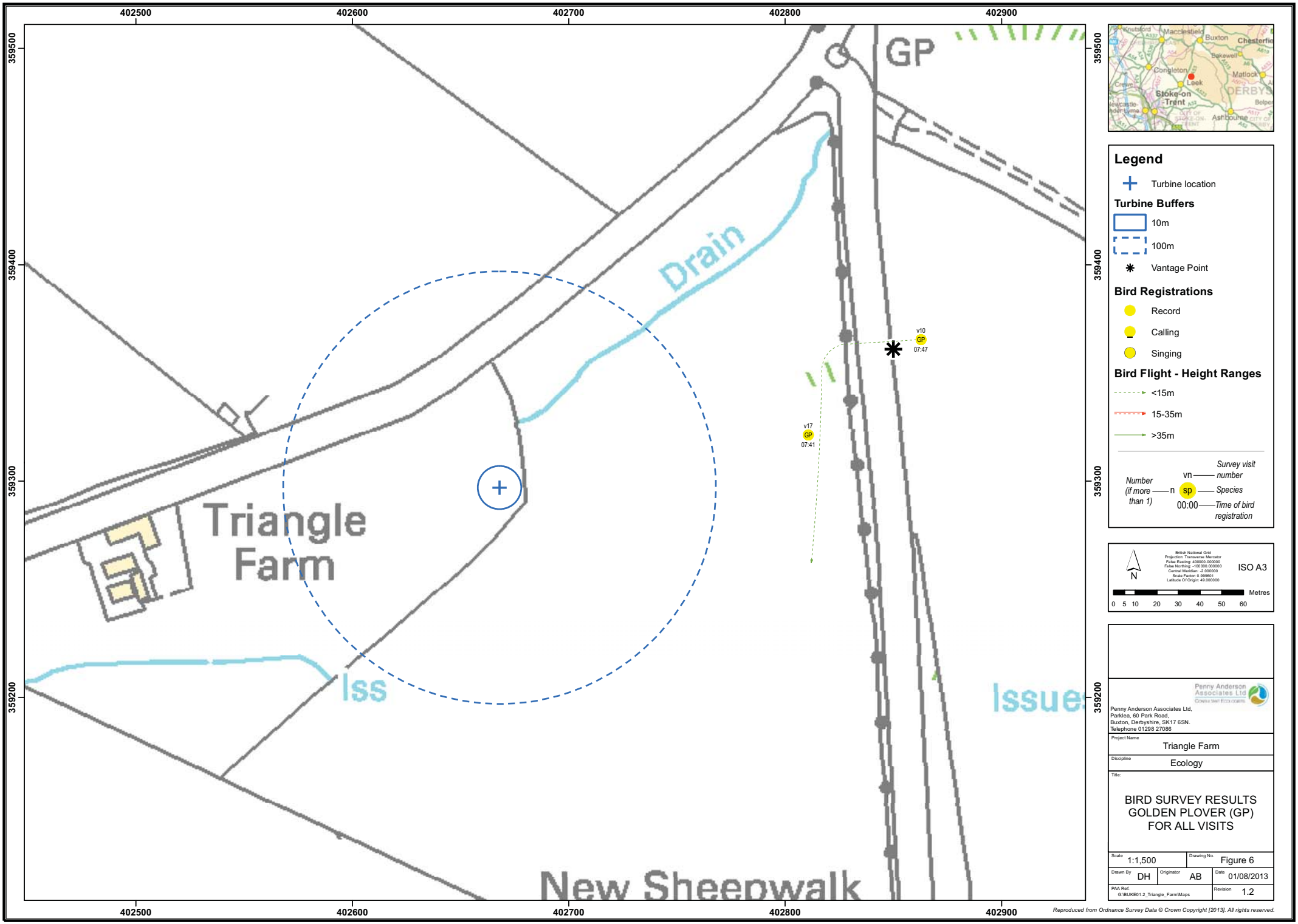
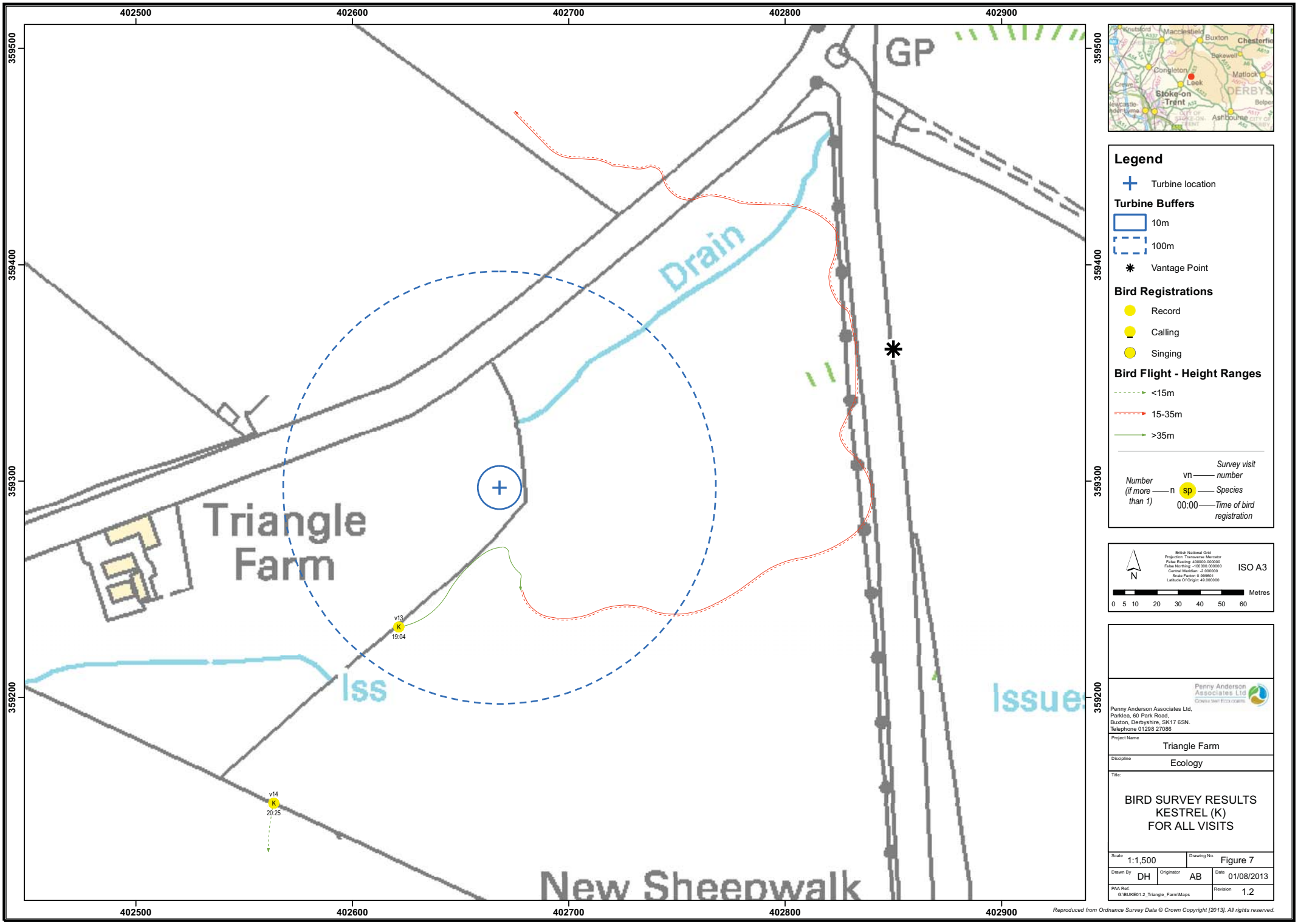
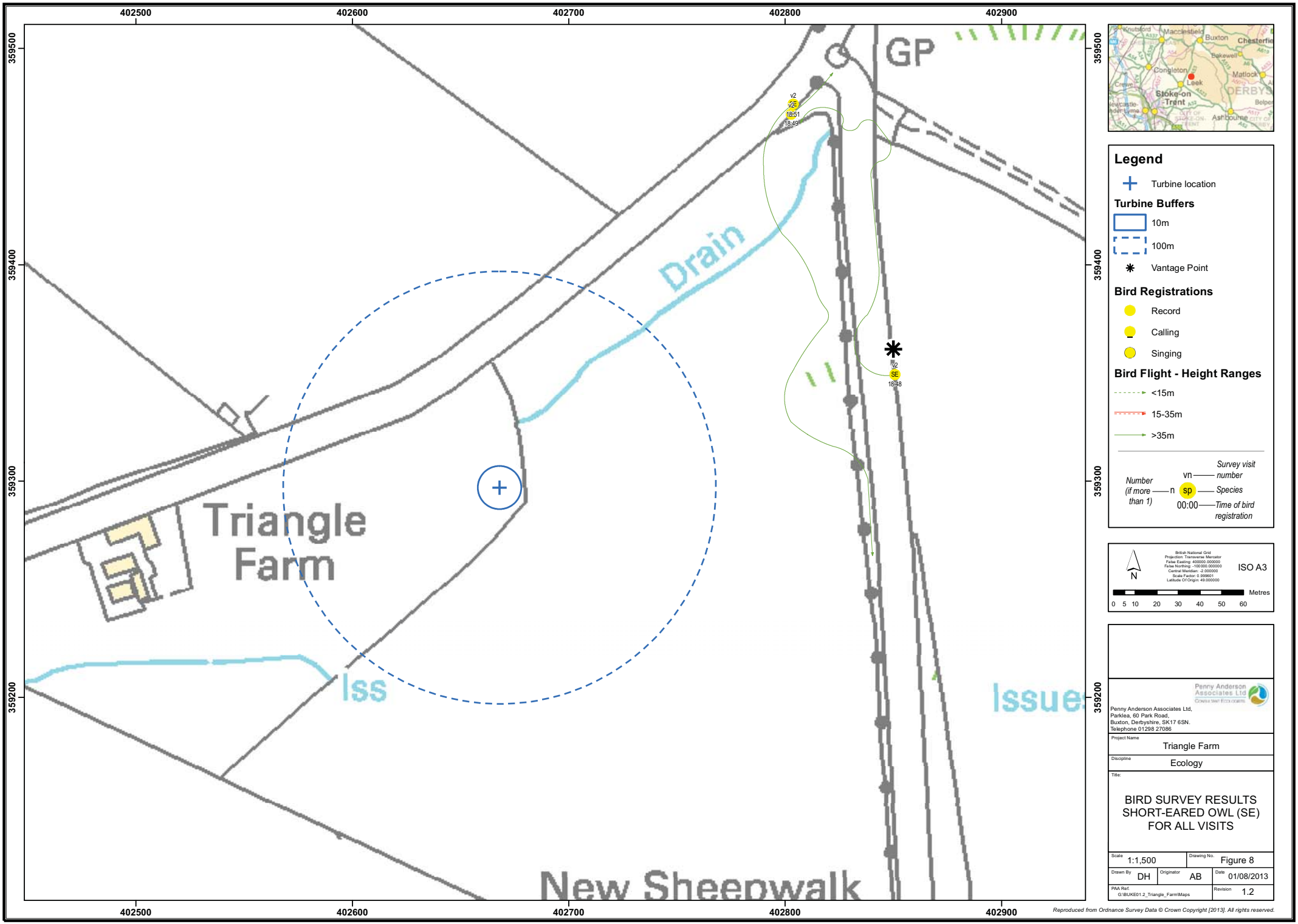
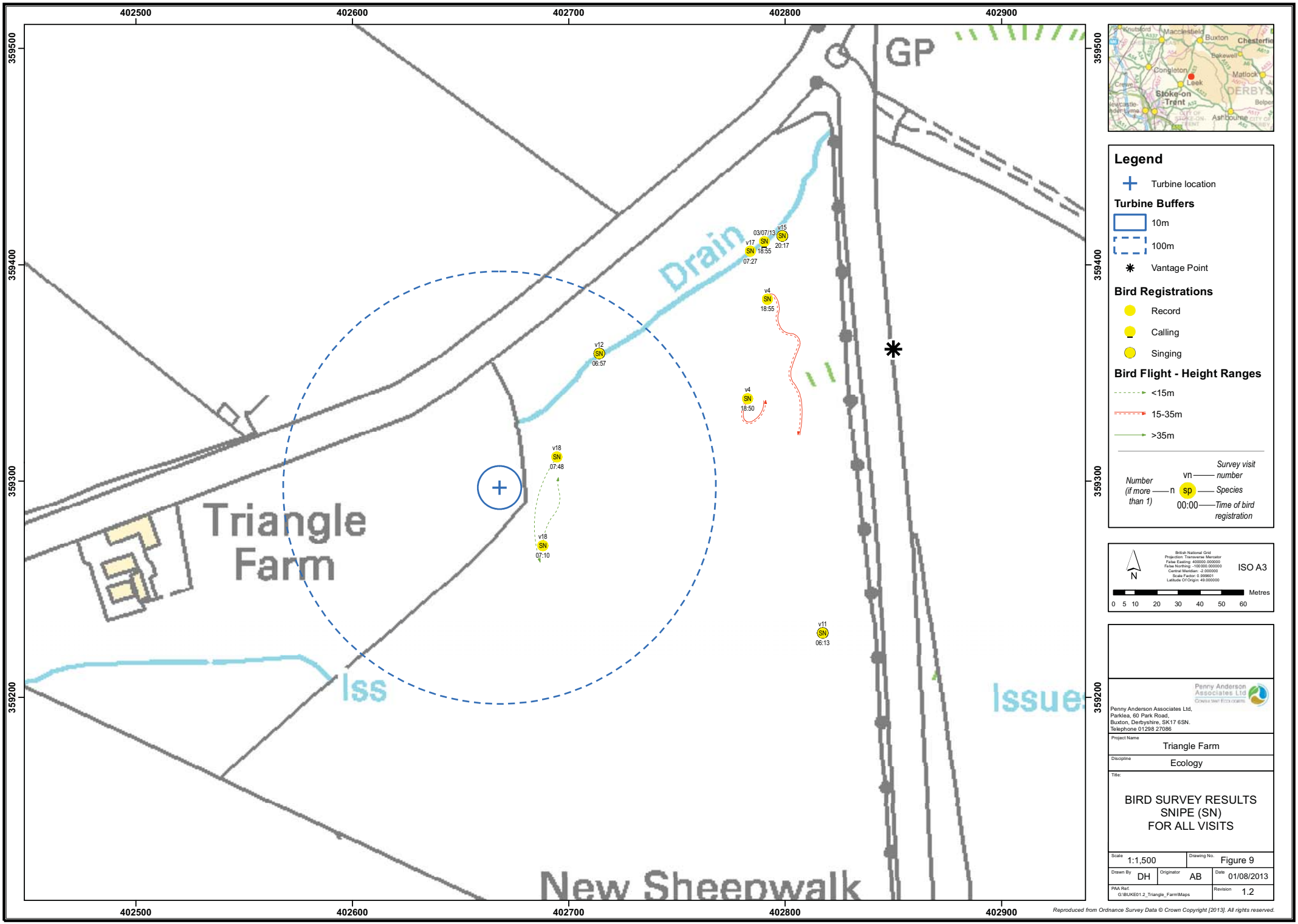
PAA Ref.: G:\BUKE01.2_Triangle_Farm\Maps		Revision: 1.2	









Legend

- 150m proposed turbine buffer
- Proposed turbine location
- **B1.1** Unimproved acid grassland
- **B1.2** Acid grassland semi-improved
- **B2.2** Neutral grassland semi-improved
- **B4** Improved grassland
- **B5** Marshy grassland
- **B6** Poor semi-improved grassland
- **D1.1** Dry acid dwarf shrub heath
- **E2.1** Acid/Neutral flush
- **J1.3** Ephemeral/short perennial
- **J3.6** Buildings
- **G2.3** Running water - oligotrophic
- **J2.2.2** Defunct hedgerow
- **J2.4** Fence
- **J2.5** Wall

N

British National Grid
Projection: Transverse Mercator
False Easting: 400000.000000
False Northing: -100000.000000
Central Meridian: -2.000000
Scale Factor: 0.999601
Latitude Of Origin: 49.000000

ISO A3

Meters

0 10 20 40 60 80 100

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Discipline: Ecology

Title:

Predicted Extent of Construction Related Disturbance

Scale: 1:2,500		Drawing No.: Figure 10	
Drawn By: JL	Originator: SRs	Date: APR 2012	
PAA Ref: G:\BUKE01_TriangleFarmStaffs\Maps		Revision: A	

APPENDICES

APPENDIX I

Records of Target Species Included in Data Provided by SER

Appendix I Records of Target Species Included in Data Provided by SER

Common Name	Scientific Name	Location	Location Detail	Grid Ref.	Date
Short-eared Owl	Asio flammeus	Tittesworth CP	Thorncliffe	SK0158	20/10/2010
Short-eared Owl	Asio flammeus	Tittesworth CP	Ley Field	SK0158	06/12/2008
Short-eared Owl	Asio flammeus	Heathylee CP	Upper Hulme	SK0160	24/04/2004
Short-eared Owl	Asio flammeus	Tittesworth CP	Morridge (Bottomhouse to Mermaid road)	SK022573	14/12/2011
Short-eared Owl	Asio flammeus	Bradnop CP	Morridge	SK022573	14/12/2011
Short-eared Owl	Asio flammeus	Staffordshire Peak District (overview)	Morridge	SK0257	06/11/2011
Short-eared Owl	Asio flammeus	Staffordshire Peak District (overview)	Morridge	SK0257	06/12/2010
Short-eared Owl	Asio flammeus	Heathylee CP	Swainsmoor	SK0261	31/12/2008
Short-eared Owl	Asio flammeus	Onecote CP	Mermaid Inn	SK0360	08/03/2010
Short-eared Owl	Asio flammeus	Onecote CP	Mermaid Inn	SK0360	12/10/2008
Short-eared Owl	Asio flammeus	Onecote CP	Mermaid Inn	SK0360	09/12/2007
Short-eared Owl	Asio flammeus	Onecote CP	Mermaid Inn	SK0360	20/04/2007
Short-eared Owl	Asio flammeus	Onecote CP	Mermaid Inn	SK0360	04/12/2005
Short-eared Owl	Asio flammeus	Onecote CP	Gliding Field	SK0360	01/11/2005
Short-eared Owl	Asio flammeus	Onecote CP	Mermaid Inn	SK0360	24/09/2004
Short-eared Owl	Asio flammeus	Onecote CP	Mermaid Inn	SK0360	28/03/2004
Short-eared Owl	Asio flammeus	Heathylee CP	Strines	SK0361	21/05/2007
Short-eared Owl	Asio flammeus	Morridge Moor		SK0361	26/11/1988
Short-eared Owl	Asio flammeus	Onecote CP	Merryton Low	SK0460	04/02/2009
Short-eared Owl	Asio flammeus	Onecote CP	Merryton Low	SK0460	28/03/2005
Short-eared Owl	Asio flammeus	Black Brook Nature Reserve (overview)		SK06	09/02/2002
Hen Harrier	Circus cyaneus	Tittesworth CP	Bradshaw Moor	SK0159	06/03/2008
Hen Harrier	Circus cyaneus	Onecote CP	Merryton Low	SK0460	12/02/2008
Hen Harrier	Circus cyaneus	Warslow and Elkstones CP	Warslow Moors area	SK05	28/02/2008
Hen Harrier	Circus cyaneus	Warslow and Elkstones CP	Warslow Moors	SK05	16/02/2008
Hen Harrier	Circus cyaneus	Swallow Moss (overview)	Swallow Moss	SK06	22/11/2008
Hen Harrier	Circus cyaneus	Ramshaw Rocks		SK06	30/01/2005
Merlin	Falco columbarius	Onecote CP	Mermaid Inn	SK0360	25/11/2005
Merlin	Falco columbarius	Onecote CP	Merryton Low	SK0460	24/10/2010
Merlin	Falco columbarius	Onecote CP	Merryton Low	SK0460	08/04/2007
Merlin	Falco columbarius	Warslow and Elkstones CP	Elkstones Village	SK05	25/10/2008
Merlin	Falco columbarius	Swallow Moss (overview)	Swallow Moss	SK06	01/01/2008
Peregrine Falcon	Falco peregrinus	Tittesworth CP	Thorncliffe	SK0158	17/06/2005
Peregrine Falcon	Falco peregrinus	Heathylee CP	Upper Hulme	SK0160	30/05/2011
Peregrine Falcon	Falco peregrinus	The Roaches (overview)	Roaches Ridge	SK06	21/03/2008
Golden Plover	Pluvialis apricaria	Staffordshire Peak District (overview)	Morridge	SK0257	08/04/2011
Golden Plover	Pluvialis apricaria	Staffordshire Peak District (overview)	Morridge	SK0257	22/04/2010
Golden Plover	Pluvialis apricaria	Staffordshire Peak District (overview)	Morridge	SK0257	04/04/2010
Golden Plover	Pluvialis apricaria	Onecote CP	Mixon Hay	SK0357	15/04/2007
Golden Plover	Pluvialis apricaria	Onecote CP	Feltysitch	SK0359	09/05/2010
Golden Plover	Pluvialis apricaria	Onecote CP	Gliding Field	SK0360	01/11/2005
Golden Plover	Pluvialis apricaria	Onecote CP	Gliding Field	SK0360	22/11/2003
Golden Plover	Pluvialis apricaria	Highmoor (west of)		SK039592	January 1979
Little Owl	Athene noctua	Tittesworth CP	Thorncliffe	SK0158	29/10/2003
Little Owl	Athene noctua	The Roaches (overview)	Roaches Gate	SK06	11/06/2008
Buzzard	Buteo buteo	Tittesworth CP	Thorncliffe	SK0158	23/02/2008
Buzzard	Buteo buteo	Heathylee CP	Upper Hulme	SK0161	12/06/2005
Buzzard	Buteo buteo	Heathylee CP	between Thorncliffe and Mermaid	SK0259	05/01/2008
Buzzard	Buteo buteo	Onecote CP	Mixon Hay	SK0357	14/11/2010
Buzzard	Buteo buteo	Onecote CP	Mixon Hay	SK0357	05/06/2010
Buzzard	Buteo buteo	Onecote CP	Mixon Hay	SK0357	09/05/2010
Buzzard	Buteo buteo	Onecote CP	Feltysitch	SK0359	05/06/2010
Buzzard	Buteo buteo	Warslow and Elkstones CP	Royledge	SK0459	28/12/2009
Buzzard	Buteo buteo	Warslow and Elkstones CP	Warslow Moors	SK05	16/02/2008
Buzzard	Buteo buteo	Coombes Valley Nature Reserve		SK05	24/09/2005
Buzzard	Buteo buteo	Coombes Valley Nature Reserve	Coombes	SK05	03/06/2005
Buzzard	Buteo buteo	Coombes Valley Nature Reserve	Coombes	SK05	04/05/2005
Buzzard	Buteo buteo	Onecote CP		SK05	21/03/2000
Buzzard	Buteo buteo	Quarnford CP	Three Shires Head area	SK06	25/03/2005
Marsh Harrier	Circus aeruginosus	Onecote CP	Mermaid Inn	SK0360	26/04/1994
Kestrel	Falco tinnunculus	Tittesworth CP	Thorncliff	SK0259	14/11/2010
Kestrel	Falco tinnunculus	Tittesworth CP	Thorncliffe - Triangle Farm	SK0259	28/12/2009
Kestrel	Falco tinnunculus	Tittesworth CP	Thorncliff	SK0259	25/06/2009
Kestrel	Falco tinnunculus	Tittesworth CP	Thorncliff	SK0259	11/04/2009
Kestrel	Falco tinnunculus	Tittesworth CP	Thorncliffe - Triangle Farm	SK0259	24/02/2009

Common Name	Scientific Name	Location	Location Detail	Grid Ref.	Date
Kestrel	Falco tinnunculus	Heathylee CP	SK0259 Blackshaw Moor	SK0259	23/09/2005
Kestrel	Falco tinnunculus	Hurdlow (south-east of)		SK026603	29/08/1978
Kestrel	Falco tinnunculus	Morridge: Feltysitch (moorland west of)		SK033597	30/08/1978
Kestrel	Falco tinnunculus	Onecote CP	Mixon Hay	SK0357	14/11/2010
Kestrel	Falco tinnunculus	Onecote CP	Mixon Hay	SK0357	09/05/2010
Kestrel	Falco tinnunculus	Onecote CP	Feltysitch	SK0359	05/06/2010
Kestrel	Falco tinnunculus	Onecote CP	Feltysitch	SK0359	28/12/2009
Kestrel	Falco tinnunculus	Morridge Moor		SK0361	26/11/1988
Kestrel	Falco tinnunculus	Onecote CP	Mixon	SK0457	11/06/2011
Kestrel	Falco tinnunculus	Onecote CP	Mixon	SK0457	01/05/2011
Kestrel	Falco tinnunculus	Warslow and Elkstones CP	Royledge	SK0459	28/12/2009
Kestrel	Falco tinnunculus	Onecote CP	Merryton Low	SK0460	24/08/2011
Kestrel	Falco tinnunculus	Onecote CP	Merryton Low	SK0460	24/11/2010
Kestrel	Falco tinnunculus	Warslow and Elkstones CP	Warslow Moors	SK05	01/01/2008
Kestrel	Falco tinnunculus	SK05	Warslow-Manifold Valley-Grindon-Warslow	SK05	18/09/2005
Kestrel	Falco tinnunculus	Coombes Valley Nature Reserve		SK05	07/05/2005
Kestrel	Falco tinnunculus	Quarnford CP	Three Shires Head area	SK06	25/03/2005
Barn Owl	Tyto alba	Blackshaw Moor		SK0059	15/07/2009
Barn Owl	Tyto alba	Anzio Training Camp		SK010591	10/04/2008
Barn Owl	Tyto alba	Tittesworth CP	Thorncliffe	SK0158	27/10/2010
Barn Owl	Tyto alba	Tittesworth CP	Thorncliffe	SK0158	25/10/2008
Barn Owl	Tyto alba	Onecote CP	near Mermaid Inn	SK0360	13/07/2006
Barn Owl	Tyto alba	Staffordshire Peak District (overview)	road verge, Reapsmoor	SK06	August 2001
Barn Owl	Tyto alba	Swallow Moss (overview)	on road	SK06	1999
Snipe	Gallinago gallinago	Heathylee CP	Upper Hulme	SK0160	03/05/2005
Snipe	Gallinago gallinago	Thorncliffe Moor: Leyfields (south-east of)	wetter parts	SK019586	19/05/1982
Snipe	Gallinago gallinago	Whitehouse Farm (south-west of)	field 1 acid/neutral flush	SK020591	10/09/1999
Snipe	Gallinago gallinago	Thorncliffe Moor: Sheepwalk (south-west of)		SK024587	19/05/1982
Snipe	Gallinago gallinago	Tittesworth CP	Thorncliffe - Triangle Farm	SK0259	28/12/2009
Snipe	Gallinago gallinago	Tittesworth CP	Thorncliffe - Triangle Farm	SK0259	14/04/2007
Snipe	Gallinago gallinago	Tittesworth CP	Thorncliffe - Triangle Farm	SK0259	2004
Snipe	Gallinago gallinago	Heathylee CP	Blackshaw Moor (within national park)	SK0259	10/09/1992
Snipe	Gallinago gallinago	Blackshaw Moor (east)		SK026599	30/06/2006
Snipe	Gallinago gallinago	Blackshaw Moor (east)		SK026599	30/06/2006
Snipe	Gallinago gallinago	Hurdlow (south-east of)		SK026603	29/08/1978
Snipe	Gallinago gallinago	Morridge: Feltysitch (moorland west of)		SK033597	30/08/1978
Snipe	Gallinago gallinago	Onecote CP	Mixon Hay	SK0357	12/04/2007
Snipe	Gallinago gallinago	Onecote CP	Feltysitch	SK0359	05/06/2010
Snipe	Gallinago gallinago	Onecote CP	Feltysitch	SK0359	09/05/2010
Snipe	Gallinago gallinago	Onecote CP	Feltysitch	SK0359	28/12/2009
Snipe	Gallinago gallinago	Onecote CP	Feltysitch	SK0359	24/05/2009
Snipe	Gallinago gallinago	Warslow and Elkstones CP	Royledge	SK0459	28/12/2009
Snipe	Gallinago gallinago	Warslow and Elkstones CP	Brindley Croft	SK0459	24/05/2009
Snipe	Gallinago gallinago	Manifold Valley (overview)	Brund area	SK05	May 1972 - November 1972
Snipe	Gallinago gallinago	Quarnford CP	Three Shires Head area	SK06	25/03/2005
Curlew	Numenius arquata	Leekfrith CP	Nether Hay	SK0060	2004
Curlew	Numenius arquata	Heathylee CP	Upper Hulme	SK0160	02/04/2010
Curlew	Numenius arquata	Heathylee CP	Upper Hulme	SK0161	2004
Curlew	Numenius arquata	Ferny Knowl, Warslow Moors		SK0161	17/04/1992
Curlew	Numenius arquata	Whitehouse Farm (verges south of)		SK023592	May 2003 - September 2003
Curlew	Numenius arquata	Thorncliffe Moor: Sheepwalk (south-west of)		SK024587	19/05/1982
Curlew	Numenius arquata	Staffordshire Peak District (overview)	Morridge	SK0257	04/04/2010
Curlew	Numenius arquata	Onecote CP	Old Mixon Hay	SK0258	17/04/2007
Curlew	Numenius arquata	Hurdlow (south-east of)		SK026603	29/08/1978
Curlew	Numenius arquata	Morridge: Feltysitch (moorland west of)		SK033597	30/08/1978
Curlew	Numenius arquata	Onecote CP	Mixon Hay	SK0357	05/06/2010
Curlew	Numenius arquata	Onecote CP	Mixon Hay	SK0357	09/05/2010
Curlew	Numenius arquata	Onecote CP	River Hamps Western - Watershed north of Onecote	SK0357	1992

Common Name	Scientific Name	Location	Location Detail	Grid Ref.	Date
Curlew	Numenius arquata	Onecote CP	Feltysitch	SK0359	05/06/2010
Curlew	Numenius arquata	Onecote CP	Feltysitch	SK0359	09/05/2010
Curlew	Numenius arquata	Onecote CP	Feltsitch	SK0359	2004
Curlew	Numenius arquata	Onecote CP	Mermaid Inn	SK0360	2004
Curlew	Numenius arquata	Onecote CP	Mixon	SK0457	11/06/2011
Curlew	Numenius arquata	Onecote CP	Mixon	SK0457	01/05/2011
Curlew	Numenius arquata	Warslow and Elkstones CP	Royledge	SK0459	2004
Curlew	Numenius arquata	Coombes Valley Nature Reserve		SK05	26/05/2002
Curlew	Numenius arquata	Quarnford CP	Three Shires Head area	SK06	25/03/2005
Whimbrel	Numenius phaeopus	Onecote CP	Mermaid Inn	SK0360	27/04/2005
Lapwing	Vanellus vanellus	Leekfrith CP	Nether Hay	SK0060	26/03/2003
Lapwing	Vanellus vanellus	SK05	Bradshaw Moor	SK0159	14/06/2009
Lapwing	Vanellus vanellus	SK05	Bradshaw Moor	SK0159	14/06/2009
Lapwing	Vanellus vanellus	Heathylee CP	Upper Hulme	SK0160	03/05/2005
Lapwing	Vanellus vanellus	Heathylee CP	Upper Hulme	SK0161	29/03/2008
Lapwing	Vanellus vanellus	Blackshaw Moor		SK016595	20/08/1999
Lapwing	Vanellus vanellus	Staffordshire Peak District (overview)	Morridge	SK0257	11/04/2011
Lapwing	Vanellus vanellus	Staffordshire Peak District (overview)	Morridge	SK0257	13/03/2011
Lapwing	Vanellus vanellus	Staffordshire Peak District (overview)	Morridge	SK0257	07/03/2011
Lapwing	Vanellus vanellus	Staffordshire Peak District (overview)	Morridge	SK0257	04/04/2010
Lapwing	Vanellus vanellus	Tittesworth CP	Thorncliffe - Triangle Farm	SK0259	07/05/2011
Lapwing	Vanellus vanellus	Tittesworth CP	Thorncliffe - Triangle Farm	SK0259	2004
Lapwing	Vanellus vanellus	Heathylee CP	The Lumbs, Morridge	SK030600	May 2000
Lapwing	Vanellus vanellus	Onecote CP	River Hamps Western - Watershed north of Onecote	SK0357	25/06/1992 - 05/07/1992
Lapwing	Vanellus vanellus	Onecote CP	River Hamps Western - Watershed north of Onecote	SK0358	1992
Lapwing	Vanellus vanellus	Onecote CP	River Hamps Western - Watershed north of Onecote	SK0358	1989 - 1990
Lapwing	Vanellus vanellus	Onecote CP	Feltsitch	SK0359	2004
Lapwing	Vanellus vanellus	Onecote CP	near Mixon Hay	SK036575	11/03/2002
Lapwing	Vanellus vanellus	Onecote CP	Mixon	SK0457	11/06/2011
Lapwing	Vanellus vanellus	Warslow and Elkstones CP	Royledge	SK0459	2004
Lapwing	Vanellus vanellus	Manifold Valley (overview)	Brund area	SK05	May 1972 - November 1972
Lapwing	Vanellus vanellus	Quarnford CP	Three Shires Head area	SK06	25/03/2005
Lapwing	Vanellus vanellus	The Roaches (overview)	Ramshaw Rocks	SK06	25/04/2002
Lapwing	Vanellus vanellus	Staffordshire Peak District (overview)	Axe Edge Moor	SK06	19/07/2000

APPENDIX II

Weather Conditions During Vantage Point Surveys

Appendix II - Weather Conditions During VP Surveys

Date	Start Time	End Time	Recorder	Temp (°C)	Wind Direction	Wind Speed (Beaufort Scale)	Cloud Cover	Precipitation	Other
16/04/2013	18:35	20:35	CP	10.0	South Westerly	3	3/8	Dry	
24/04/2013	17:00	19:00	AB	12.5	Westerly	4	8/8	Dry	
29/04/2013	17:30	19:30	AB	7.0	North Westerly	4-5 (Gusting 6-7)	4/8	Dry	
08/05/2013	17:20	19:20	AB	11.5	North Easterly	3-4	7/8	Dry	
13/05/2013	17:23	19:23	AB	5.0	Westerly	4 (Gusting 5-6)	7/8	Dry	
16/05/2013	18:20	20:20	AB	10.5		2 (Gusting 3)	3/8	Dry	
21/05/2013	18:10	20:10	AB	8.0	North Westerly	3-4		Dry	Light mist
23/05/2013	18:55	20:55	AB	3.5	North Westerly	4-5	7/8	Showers	
31/05/2013	17:45	19:45	AB	15.0	North Westerly	3-4	2/8	Dry	
10/06/2013	06:10	08:10	AB	8.0	South Easterly	2-3		Dry	Light mist
14/06/2013	06:35	08:35	AB	5.0	Southerly	3-5	4/8	Dry	Light mist
19/06/2013	06:45	08:45	AB	12.0	North Westerly	2-3	7/8	Dry	
21/06/2013	17:50	19:50	AB	17.0	North Westerly	1	4/8	Dry	
24/06/2013	18:40	20:40	AB	10.0	North Westerly	3-4 (Gusting 5-6)	5/8	Dry	
29/06/2013	18:40	20:40	AB	14.0	North Westerly	3-4	8/8	Dry	
03/07/2013	18:50	20:50	AB	12.0	North Westerly	2-3	8/8	Dry	
12/07/2013	06:20	08:20	AB	13.0	North Westerly	1	1/8	Dry	Light mist
15/07/2013	05:55	07:55	AB	13.0	Northerly	1-2	0/8	Dry	

APPENDIX III

Target Species

Appendix III - Target Species

Date	Time	Species	Number	15 Sec Period	Distance Zone	Height Zone	Duration (sec)	Notes
24/04/2013	17.54	CU	1	1	3	1	5	5 seconds
	18.01	CU	1	1	3	1	5	5 seconds
	18.44	CU	1	1	3	1	5	5 seconds
	18.48	SE	1	1	3	1	45	<2m quartering verges, dropped on prey
				2	3	1		
				3	3	1		
	18.49	SE	1	1	3	1	15	<2m, flew NW
	18.51	SE	1	1	3	1	45	Flew fast over rush pasture, not hunting, returned to quartering verge, flying south
				2	3	1		
				3	3	1		
	18.53	CU	1	1	3	2	45	Reacting to SE?
				2	3	2		
				3	3	2		
29/04/2013		None						
03/05/2013	18.50	SN	1	1	3	2	15	Drumming briefly
	18.55	SN	1	1	3	2	30	Drumming
				2	3	2		
	18.59	SN	1	1	3	2	165	Drumming
				2	3	2		
				3	3	2		
				4	3	2		
				5	3	3		
				6	3	3		
				7	3	3		
				8	3	3		
				9	3	3		
				10	3	3		
				11	3	3		
13/05/2013	17.40	CU	2	1	3	1	15	
16/05/2013	19.03	CU	1	-	3	-	0	Calling from ground
	19.57	CU	1	-	3	-	0	Calling from ground
21/05/2013	19.04	CU	1	-	3	-	0	Calling from ground.
23/05/2013		None						
31/05/2013	18.04	CU	1	1	3	2	30	Flying into strong headwind and aborting journey across rush pasture.
				2	3	3		
	19.12	CU	1	1	3	2	75	Flight-calling briefly over rush pasture to east of turbine then flying back NW.
				2	2	2		
				3	3	2		
				4	3	3		
				5	3	2		
	19.17	CU	1	-	3	-	0	Calling from ground.
10/06/2013	06.37	CU	1	-	3	-	0	On ground.
	06.57a	CU	2	1	3	2	30	Flew to rush pasture / unimproved acid grassland.
				2	2	2		
	06.57b	CU	1	1	2	1	15	Flew to rush pasture / unimproved acid grassland.
	07.47	GP	1	1	3	1	15	Directly over vp, flying to rush pasture.
14/06/2013	06.38	CU	1	-	3	-	0	Calling in rush pasture to N of Thorncliffe Road.
	06.53	SN	1	-	3	-	0	Chipping to NE of turbine. Repeated intermittently throughout survey.
	06.56	CU	1	-	3	-	0	Calling to SE of turbine.
	07.21	CU	1	1	3	1	15	Flying N, then E.
	07.23	CU	1	1	3	1	15	Flying W.
	07.56	CU	1	1	2	2	15	Flying N.
19/06/2013	06.48	CU	1	-	3	-	0	Calling to N of Thorncliffe Road.
	06.57	SN	1	-	3	-	0	Chipping to NE of turbine. Repeated intermittently throughout survey.

Date	Time	Species	Number	15 Sec Period	Distance Zone	Height Zone	Duration (sec)	Notes
21/06/2013	19.04	K.	1	1	3	1	285	Hunting invertebrates from wires on SW boundary of Triangle Farm before flying E, pausing to hover over rush pasture and at various locations along road verges.
				2	3	1		
				3	3	1		
				4	3	1		
				5	3	2		
				6	2	2		
				7	2	2		
				8	2	2		
				9	2	2		
				10	3	2		
				11	3	2		
				12	3	2		
				13	3	2		
				14	3	2		
				15	3	2		
				16	3	2		
				17	3	2		
				18	3	2		
				19	3	2		
	19.40	CU	1	-	3	-	0	Calling from field to north of Thorncliffe Road.
24/06/2013	19.12	CU	1	1	3	2	15	Displaying.
	20.13	CU	1	1	3	2	15	Displaying.
	20.25	K	1	1	3	1	15	Flew SW from perch on fence where it had been for approx. 3 minutes.
29/06/2013	18.43	BZ	1	1	2	2	270	Hanging on breeze, descending on prey (unsuccessful), flying S then SW and W pausing to hang in the breeze, hunting.
				2	2	2		
				3	2	2		
				4	2	2		
				5	2	2		
				6	2	2		
				7	2	2		
				8	2	2		
				9	2	2		
				10	3	2		
				11	3	2		
				12	3	2		
				13	3	2		
				14	3	2		
				15	3	2		
				16	3	2		
				17	3	2		
				18	3	2		
	19.28	CU	1	-	3	-	0	Calling from distant field.
	20.17	SN	1	-	3	-	0	Chipping.
	20.31	BZ	1	-	3	-	0	On fence post for 9 minutes until end of survey
03/07/2013	18.53	SN	1	-	3	-	0	Chipping intermittently throughout survey from same location until 20.15.
	20.48	CU	1	-	3	-	0	Calling from rush pasture.
12/07/2013	07.27	SN	1	-	3	-	0	Chipping from rushes.
	07.41	GP	1	-	3	-	0	Foraging in recently cut rush pasture.
15/07/2013	07.10	SN	1	1	3	1	15	Chipping then moved and intermittent chipping throughout.
	07.48	SN	1	1	3	1	15	Chipping then moved.

Key

CU	Curlew
SE	Short-eared owl
SN	Snipe
GP	Golden plover
K	Kestrel
BZ	Buzzard

Distance Zones

1	0 - 10m
2	10 - 100m
3	100m+

Height Zones

1	0 - 15m
2	15 - 35m
3	35m+

APPENDIX IV

Secondary Species

Appendix IV - Secondary Species

Common Name	Latin Name	BTO code	Total	16/04/2013	24/04/2013	29/04/2013	08/05/2013	13/05/2013	16/05/2013	21/05/2013	23/05/2013	31/05/2013	10/06/2013	14/06/2013	19/06/2013	21/06/2013	24/06/2013	29/06/2013	03/07/2013	12/07/2013	15/07/2013
Blackbird	*Turdus merula*	B.	3							1				2							
Canada goose	*Branta canadensis*	CG	3									3									
Carrion crow	*Corvus corone*	C.	104	5	4	5	2	3	2	7	6	5	3	7	8	13	14	3	1	9	7
Goldfinch	*Carduelis carduelis*	GO	1															1			
Jackdaw	*Corvus monedula*	JD	2											2							
Lesser black-backed gull	*Larus fuscus*	LB	30														4	1	24		1
Linnet	*Carduelis cannabina*	LI	3													2				1	
Meadow pipit	*Anthus pratensis*	MP	115	5	2	2	2	3	3	3	2	7	7	8	11	5	4	5	10	25	11
Pheasant	*Phasianus colchicus*	PH	2																	1	1
Pied wagtail	*Motacilla alba*	PW	4		1									1						1	1
Raven	*Corvus corax*	RA	2									2									
Reed bunting	*Emberiza schoeniclus*	RB	3																1	1	1
Rook	*Corvus frugilegus*	RO	72												18	1	15			18	20
Skylark	*Alauda arvensis*	S.	67	2	3	1	3	2	2	2	2	3	6	3	7	6	4	4	4	8	5
Starling	*Sturnus vulgaris*	SG	332												35					250	47
Stock dove	*Columba oenas*	SD	2														2				
Swallow	*Hirundo rustica*	SL	22		1	3			2				6			2		3	3	1	1
Swift	*Apus apus*	SI	53						1				2		1	49					

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