Technical Appendix 5.2: Further Information Ornithology (T39 Layout)

RPS

TECHNICAL APPENDIX 5.2: STRATHY SOUTH WIND FARM FURTHER INFORMATION:

ORNITHOLOGY (T39 LAYOUT)

November 2014

11 November 2014

Project Number: SEC7232

RPS
Ocean Point One
4th Floor
94 Ocean Drive
Edinburgh
EH6 6JH

Tel: 0131 555 5011
Fax: 0131 555 4911
Email: zismans@rpsgroup.com

QUALITY MANAGEMENT

Prepared by:	Name:	**Rob Iredale**	Title:	**Senior Ecologist**
	Signature:			
	Name:	**Martin Scott**	**Title:**	**Principal Ornithologist**
	Signature:			
	Name:	**Dr. Simon Zisman**		**Operational Director**
	Signature:			
Authorised by:	Name:	**Simon Zisman**	Title:	**Operational Director**
	Signature:			
Current Status:	**Final Version**			
Issue Date:	**11 November 2014**	Revision Number:	**-**	
		Revision Notes:	**-**	
Project File Path:	**S:\Strathy Projects - All Ghost Folders\7232 SEC - SSE S South Reporting WS9 Ghost Folder\Technical\Reports in Progress\Ornithology Report 2014\Strathy South - RPS T39 Layout Ornithology Technical Appendix 111114.docx**			

This report has been prepared within the RPS Planning and Development Quality Management System to British Standard EN ISO 9001: 2008

REPORT TEMPLATE

TYPE:	Technical
ISSUE DATE:	18 May 2011
REVISION NUMBER:	1
REVISION DATE:	26 April 2012

CONTENTS

EXECUTIVE SUMMARY

This Technical Appendix to the main Further Information Report seeks to assess the potential impact of the T39 Layout on red-throated diver and greenshank; the two species for which SNH had outstanding objections to, following the submission of the 2013 ES Addendum in support of a 47 turbine layout (the Modified 2013 Scheme).

The report describes the consultation that has occurred between the Applicant and SNH in the period since the submission of the 2013 ES Addendum, and also the changes made to the proposed development in light of this consultation, which resulted in the removal of eight turbines.

Whilst the Applicant considers there is already sufficient comprehensive information in the 2013 ES Addendum from which SNH can come to a clear view, the results of additional fieldwork conducted in 2014 provides further evidence, particularly on breeding distribution and flight activity of red-throated diver. The 2014 findings report low flight activity within the red line boundary for red-throated diver and greenshank. Furthermore, the use of a camera trap at Loch 64 confirms that no breeding attempt was made there by red-throated divers in 2014.

The data from 2014 is then combined with data from 2007 onwards, along with the T39 Layout, to establish the difference in estimated collision risk for red-throated diver and greenshank. Collision risk from 2003 and 2004 data was negligible.

The collision risk was zero for red-throated diver and greenshank in 2014, and the estimates presented as an average of 2007-2014 data are substantially lower for the T39 Layout (0.14 collisions per year for red-throated diver and 0.01 collisions per year for greenshank) than was the case for the Modified 2013 Scheme assessed in the 2013 ES Addendum (0.23 collisions per year for red-throated diver and 0.04 collisions per year for greenshank).

Following extensive consultation with SNH regarding breeding greenshank at Strathy South, clarification and further methods to assess the numbers of greenshank present around the proposed development are presented using data collected in 2010 and 2012, which are the most intensive years of data collection for breeding greenshank. These outputs are related to currently accepted population estimates for the Caithness and Sutherland Peatlands Special Protection Area (SPA) and previous advice provided by SNH with respect to disturbance distances. The outputs from these methods estimating breeding greenshank abundance within 1 km of Strathy South are similar to those generated by methods used in the 2013 ES Addendum.

The report concludes with a review and update of the conclusions of the 2013 ES Addendum with regard to red-throated diver and greenshank, based on the differences between the T39 Layout and the Modified 2013 Scheme, and taking account of the addition of the 2014 field data. The conservation objectives of the Caithness and Sutherland Peatlands SPA are also considered as part of this review. The conclusions of the 2013 ES Addendum are judged to remain valid, and the predicted effects of the T39 Layout are considerably lower, and therefore even more precautionary than those relating to the Modified 2013 Scheme (47 turbine layout).

It is concluded that the proposed Strathy South T39 Layout can be built, operated and decommissioned without an adverse impact on the integrity of the Caithness and Sutherland Peatlands SPA.

1 INTRODUCTION

In 2007, SSE Generation Limited (hereafter referred to as 'the Applicant') submitted an application to the Energy Consents and Deployment Unit (ECDU) of the Scottish Government (07/00263/S36SU) for consent under section 36 of the Electricity Act 1989 (and deemed planning permission), for a wind farm known as Strathy South, located near Strathy, in Sutherland (hereafter referred to as the Original 2007 Scheme).

An Environmental Impact Assessment (EIA) was undertaken in relation to the proposed wind farm in accordance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (the 'EIA Regulations'), as amended, and an Environmental Statement (hereafter referred to as 'the 2007 ES') was submitted alongside the application. The 2007 application remained undetermined pending receipt of additional information as requested by stakeholders in relation to a number of specific matters arising through the application consultation process.

To address these matters and to further reduce environmental impact, the Applicant made modifications to the Original 2007 Scheme and, in September 2012, confirmed its intention to produce an ES Addendum for the modified scheme (hereafter referred to as 'the Modified 2013 Scheme'). Therefore, an ES Addendum was prepared on behalf of the Applicant by SSE Renewables Developments (UK) Ltd to address the issues raised by consultees and to report on the changes to the environmental assessment resulting from the modifications made to the scheme (Figure 1). Much of the assessment reported within the 2007 ES was still relevant to the Modified 2013 Scheme. The 2013 ES Addendum chapters reported how the modifications to the Original 2007 Scheme affected the conclusions of the 2007 ES (if at all).

The 2013 ES Addendum was submitted to ECDU in July 2013. Further consultation has been undertaken with the consultees following submission, in particular with The Highland Council (THC), Scottish Natural Heritage (SNH) and the Ministry of Defence (MoD) (as considered in more detail in Section 3: Consultation).

Having considered the 2013 ES Addendum, SNH's previous objections to the original 2007 Strathy South application on habitats and non-avian protected species have all been resolved.

Furthermore, SNH has now confirmed that subject to deletion of seven turbines from the 2013 Modified Scheme (as assessed in the 2013 ES Addendum), there are only two bird species over which it has remaining concerns (red-throated diver and greenshank). These concerns arise from issues SNH has regarding the perceived uncertainty over the wind farm's predicted effects on these species.

The deletion of three of the same turbines as SNH and one additional turbine enabled the Ministry of Defence to withdraw its objection. There are no other objections from any statutory consultee, other than SNH concerns over the prediction of effects on red-throated diver and greenshank, in relation to which objections are maintained.

THC considered the proposals at its North Planning Application Committee on 10 June 2014. The planning officer's recommendation was "Raise no objection (subject to the removal of 8 turbines)". Furthermore, the report concludes "There are some significant adverse impacts to taken into account with the application, but the development is also considered to be acceptable on many of the specific criteria set out in the Development Plan. The impact of the project is also reversible in that permission is being sought for a period of 25 years after which time the infrastructure can be removed and the site largely restored to open moorland. The removal of over 1,000 ha of non-native woodland and significant peat land restoration is seen as a significant benefit. The application is one that can be seen as being located and sited such that it will not be significantly detrimental overall, either individually or cumulatively with other operational onshore wind farms. The application, with the exception of the matters highlighted above (SNH objection re the SPA on two bird species) is one which is seen to otherwise accord with the policies of the Council's Development Plan. The application is therefore one which on a planning balance basis should be supported."

Following this, against officer recommendation, the Committee nevertheless determined that THC's response to this consultation was "to object to the application on the basis of the concerns highlighted in the objections raised by Scottish Natural Heritage, thereby the proposal was contrary to the Council's Highland-wide Local Development Plan, Policies 57 (Natural, Built and Cultural Heritage) and 67 (Renewable Energy)." Thus, the THC objection rests upon the objection from SNH in relation to red-throated diver and greenshank.

The Applicant confirmed to ECDU in July 2014 that it wished Scottish Ministers to move to determination of the application which will necessitate, under the terms of Paragraph 2(2) of Schedule 8 to the Electricity Act 1989, Scottish Ministers to call a public inquiry. In the meantime, the resolution of SNH concerns has been the subject of detailed discussion between the Applicant and SNH. As confirmed in correspondence from the Applicant's planning consultants to the Directorate for Planning and Environmental Appeals, the Applicant has reduced the scale of the project by eight turbines and is now seeking consent for a 39 turbine wind farm.

This report has therefore been prepared to provide details on the ornithological effects of a reduction in turbine numbers from 47 (Modified 2013 Scheme; Figure 1) to a 39 turbine option (hereafter referred to as the 'T39 Layout'). This option would see the deletion of eight turbines (T51, T55, T62, T63, T68, T73, T74 and T76) (T39 Layout; Figure 2). The report takes account of the detailed discussions with SNH, and includes clarification of a number of points requested by SNH and results from 2014 fieldwork.

2 REPORT SCOPE AND STRUCTURE

This report assesses the effects of the proposed T39 Layout on the two species still of concern to SNH, namely red-throated diver (*Gavia stellata*) and greenshank (*Tringa nebularia*) and assesses the impacts of the T39 Layout on these birds, in light of detailed discussions with SNH and also 2014 fieldwork results.

This report is structured as follows:

- Section 3 summarises the consultation that has led to the request for the removal of eight turbines;
- Section 4 provides an overview of the proposed development and describes elements of the proposals where amendments have been made as a result of the reduction in turbine numbers which have the potential to alter the impact of the development on the species named above;
- Section 5 describes the ornithological surveys carried out during 2014, which focussed on breeding distribution and flight activity of red-throated divers in particular;
- Section 6 presents details of the deployment of an automated camera at Loch 64 as a means of detecting red-throated diver activity during the 2014 field season;
- Section 7 provides updated collision risk modelling (CRM) based on the T39 Layout and incorporating the 2014 flight activity data;
- Section 8 presents clarification and further methods to assess the numbers of greenshank present around the proposed development, whilst relating these findings to currently accepted population estimates for the surrounding area and previous advice provided by SNH with respect to disturbance distances; and
- Section 9 considers the effects of design change on conclusions of 2013 ES Addendum; providing a review of the bird-related environmental effects as a result of turbine deletions where a difference occurs between the Modified 2013 Scheme (assessed in the 2013 ES Addendum) and the T39 Layout on greenshank and red-throated diver.

3 CONSULTATION

Since the 2013 ES Addendum was submitted in July 2013, there has been ongoing consultation with a variety of statutory and non-statutory consultees. SNH and MoD both raised objections to the Modified 2013 Scheme and requested deletion of certain turbines to resolve specific matters. Table 3.1 provides a summary of the post-submission consultation involving SNH and MoD and how the comments have been taken into consideration in the development of the T39 Layout.

All correspondence related to red-throated diver and greenshank between the Applicant and SNH is reproduced in full in Appendix 4.

TABLE 3.1 – CONSULTATION SUMMARY

Consultee	Date	Consultee Comment	Further information, including how comments have been dealt with
MoD (David Naylor-Gray)	02/09/13	**Objection:** The wind farm would be located in TTA14T [Tactical Training Area 14 Tango]. This is an area where low flying operations take place down to 100 ft separation above ground level. Specifically, a part of the proposed development would obstruct one of two corridors where pilots can practice flying in low cloud and using terrain following radar. Loss of this corridor would significantly impact of the ability of the RAF to conduct vital low flying operations. MoD has been in discussion with SSE Renewables to identify mitigation which would enable them to withdraw its objection. Turbines 68, 73, 74 and 76 form the obstruction. If these turbines were to be deleted from the project, this would remove the obstruction to an extent whereby the MOD would have no reason to object to the proposal. If these turbines were removed - MoD would request that remaining turbines are fitted with aviation safety lighting.	T68, T73, T74 and T76 have been deleted from the Modified 2013 Scheme (Figures 1 and 2), and aviation lighting will be added (as agreed with MoD), which will enable the MoD to withdrawn its objection to the development.
SNH (David Mackay)	20/11/13	**Objection: Caithness and Sutherland Peatlands SPA**	
		Red-throated diver Insufficient information to determine whether the proposal is likely to have a significant effect on the red-throated diver qualifying interest of the site. In order for this to be determined, we recommend a worked example for red-throated diver collision risk calculations to demonstrate the method of working to allow us to check the quoted figures. Provision of more robust data on preferred flight lines of divers using lochan 64.	Collision Risk Modelling (CRM) calculations were provided as requested. There has also been ongoing dialogue with SNH, which is described later in this table. Public Local Inquiry (PLI) called due to SNH's residual concerns on this species. Refer to Sections 5, 6, 7 and 9 of this report for further information on red-throated divers.
		Greenshank We cannot conclude that predicted collision values for greenshank are accurate (within the constraints of collision risk modelling). Therefore on a precautionary basis we cannot safely conclude that there will not be an adverse effect on site integrity for greenshank. Suggested removal of turbines within 800m of greenshank territories to mitigate effects on breeding greenshank.	There has been ongoing dialogue with SNH, described below. PLI called due to SNH's residual concerns on this species. Refer to Section 5, 7, 8 and 9 of this report for further information on greenshank.
		Golden Eagle One eagle nest site is located c.2.5 km south of the Strathy South site boundary. Forestry clearance and wind farm construction are considerably more disruptive than most other activities that can cause eagle disturbance. The location of the eyrie with respect to the wind farm suggests that it may be particularly vulnerable.	Reference was made to previous published work on safe working distances. The possibility of additional fieldwork was suggested.
		Hen Harrier	

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Consultee	**Date**	**Consultee Comment**	**Further information, including how comments have been dealt with**
		We recommend that a worked example for hen harrier collision risk calculations is obtained to demonstrate the method of working to allow us to check the quoted figures. It is important that we receive reassurance on this, because we consider that the number of flights recorded, together with their height distribution, would normally give rise to a level of predicted mortality well above the figures set out in the Addendum.	More detailed presentation of flight heights and working model of CRM was provided, enabling SNH to withdraw its objection for this species.
		Black-throated diver The lack of specific evidence to inform an assessment of wind farm disturbance on this species, together with its scarcity in Scotland, suggests that a precautionary approach to assessment is appropriate. At present it cannot be ruled out that displacement and permanent loss of one breeding pair from the SPA would occur which would adversely affect the population. Suggested removal of turbines 55, 62, 63, 68, 73 and 74 to mitigate effects on breeding black-throated diver.	Turbines 55, 62, 63, 68, 73 and 74 have been deleted to mitigate effects on breeding black-throated diver (Figures 1 and 2), enabling SNH to withdraw its objection for this species.
		Wood sandpiper The proposed wind farm may displace (or disturb) one pair of breeding wood sandpiper. We also advise that the proposed wind farm may lead to the loss, through collision, of one pair of breeding wood sandpiper that could adversely affect the population of the species as a component of the SPA. Suggested removal of turbine 51 to mitigate effects on breeding wood sandpiper;	Turbine 51 has been removed to mitigate effects on breeding wood sandpiper (Figures 1 and 2), enabling SNH to withdraw its objection for this species.
SNH (David Mackay)	06/02/14	**Objection: Caithness and Sutherland Peatlands SPA**	
		Red-throated diver We welcome clarification that no watches of seven hours were carried out. We consider that the vantage point effort covering Loch 64 falls short of our recommendations. Additional VP work to inform a robust assessment of flight activity rates and flight directions for Loch 64 should be carried out.	Although the Applicant considers sufficiently comprehensive and robust information was presented in the 2013 ES Addendum, further surveys were undertaken (detailed in Sections 5 and 6), including multiple vantage points and camera placed at Loch 64 to attain further insights into Loch 64 usage in 2014.
		Greenshank We welcome the additional information on distance detection, but remain concerned that the apparent reduction in detectability at 0-250m compared with 250-500m may indicate that observer disturbance has occurred. This would make the modelling of detectability distances very difficult. We recommend that any corrections should be based on published approaches to this problem (e.g. Buckland et al 2001, Buckland et al 2007). We consider it necessary that all records of greenshank from the 2010 and 2012 surveys are presented to enable consistent judgements on the status of the species within and around the development site. We also recommend that a more detailed analysis is carried out to clarify how territory centres were calculated. We accept that defining territories and therefore breeding numbers for greenshank can be difficult. However, we find it difficult to relate decisions made about the territory locations based on the information provided in the ES. It is not clear what grid references refer to (e.g. are they putative territory centres or do all records for one grid reference really relate to multiple sightings at the same location). This is a problem because distances from turbines are calculated on these grid references, yet we are left unclear as what exactly the grid references (and mapped locations) actually refer to. Nor is it clear whether any reference has been made in making such decisions to Hancock (1997), whereby a cut-off distance of 800m is applied to separate registrations for the 1995 survey as a means of defining separate territories. The lack of clarity	There has been ongoing dialogue with SNH regarding these issues, including consideration of available methods for greenshank territory analysis. PLI called due to SNH's residual concerns on this species. Further information on greenshank is presented in Sections 5, 7, 8 and 9 of this report, in order to clarify these matters.

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Consultee	**Date**	**Consultee Comment**	**Further information, including how comments have been dealt with**
		makes it difficult to determine with confidence how many breeding pairs occur within the survey area.	
		Golden Eagle We note that you consider the 3.5 km buffer figure excessively precautionary. We also note that SSER does not consider it necessary to investigate the line of sight from this territory's eyries but will do so as a 'gesture of goodwill'.	Although the Applicant considers sufficiently comprehensive and robust information was presented in the 2013 Addendum, further fieldwork was offered to confirm 'line of sight' data, but SNH re-assessed its position on 30/04/14 and removed its objection for this species.
SNH (David Mackay)	21/03/14	**Caithness and Sutherland Peatlands SPA**	
		Red-throated diver We consider that there has not been enough dawn and dusk watches covering Loch 64 and there is too much reliance on the generic vantage point watches. Additional vantage point work to inform a robust assessment of flight activity rates and flight directions for Loch 64 should be carried out. We would be happy to provide advice on the level of additional survey work required.	Additional surveys undertaken during 2014 breeding season and reported in Sections 5 and 6.
		Greenshank We welcome the reanalysis of greenshank registrations. The number of territory centres within 800m of a turbine now appears to be greater than in previous analyses. Because of the novel nature of assessment we intend to consider the submitted information further.	Clarification using published methods of characterising greenshank territories was presented to SNH in October 2014.
SNH (David Mackay)	30/04/14	**Caithness and Sutherland Peatlands SPA**	
		Red-throated diver i) Survey Effort: The amount of effort on Loch 64 does not meet survey guidelines. The two survey years for which the best data exist are 2010 and 2012. We consider that there are insufficient hours to establish an accurate level of flight activity and the directions in which birds flew, to and from feeding locations. ii) Collision Risk: Potential collision risk alone and in combination with other wind farms which affect the SPA may be underestimated, because we do not have a complete picture of flight activity; and the low level of flight activity will underestimate potential collision risk. iii) Disturbance: We must consider construction disturbance at loch 64 (an SPA pair) which is likely to be temporary and may be permanent. The location of loch 64 suggests that disturbance during construction and subsequent operation may lead to the loss of this pair. Additional vantage point work to inform a robust assessment of flight activity rates and flight directions for loch 64 should be carried out. We acknowledge that loch 64 is not used in every year by breeding red-throated divers, so further survey work may not be of help.	As highlighted, additional fieldwork undertaken in 2014 and reported in Sections 5 and 6, including camera placed at Loch 64 to attain further insight regarding site usage for 2014.
		Greenshank The blanket bog habitat is particularly suitable for greenshank and supports high densities. RPS data suggest that this is of the order of 20 breeding pairs. A Generalized Linear Mixed Model (GLMM) has been used to show that detectability declines with distance from any vantage point, but also that detectability nearest any particular vantage point is lower than might be expected. The reasons for this are unclear though it is possible (indeed likely) that birds are reacting to the presence of the observer. RPS has used a method to correct for this, but this is subject to assumptions about how detectability declines with distance from the observer. It is this detectability function that is open to doubt, and if as seems possible, the detection	The notion of an 800m buffer for greenshank has been queried, as this far exceeds distances previously advised at other sites. Additional work relating to published methods regarding the use of distance detection for this purpose was presented to SNH at a meeting on 21/10/14.

TABLE 3.1 – CONSULTATION SUMMARY			
Consultee	**Date**	**Consultee Comment**	**Further information, including how comments have been dealt with**
		function used still underestimates flight activity, then the collision risk will be similarly underestimated. The approach taken in our original response was to define a buffer distance (800m) around putative territory centres which would, in our estimation, reduce the potential for interaction with the turbines and therefore collision risk, to a level that would be acceptable. This would involve removal or moving turbines. Using RPS data, it is calculated that in 2010 16 territories lie within 800m of the nearest turbine (any one territory centres may be within 800m of more than one turbine). In 2012, the comparable figure is 15 territories. Why have we used a figure of 800m? There are two reasons for this: firstly the figure of 800m is used by Hancock (1997) as a minimum separation distance between greenshank pairs, and looking at the greenshank territory registrations, mean separation distances appear to fall within this distance band. Secondly, and perhaps more importantly, flight activity is marked (even accounting for distance detection) out to about 1,000m. We see no reason why, given the absence of constraints by neighbours, greenshank would not fly out to this distance in the vicinity of constructed turbines (unless of course they showed marked behavioural displacement) which is not obvious from other evidence provided by RPS from other sites where there is some flight data from greenshank, in the vicinity of turbines.	
		Golden Eagle We have previously advised that the eagle nest site located to the south of the wind farm site boundary was vulnerable to disturbance. We advised that no forest removal or wind farm construction operations within 3.5 km should be undertaken during the period February to August inclusive to mitigate for breeding golden eagle. Following an internal review of our advice, we have concluded that disturbance distances are considerably less than 3.5km. Given that little flight activity was recorded over the proposed wind farm area or adjacent land, displacement impacts are also likely to be negligible. As a result of our review we withdraw our objection with respect to golden eagle.	Objection for this species withdrawn, therefore no further work proposed.
		Caithness and Sutherland Peatlands SPA	
SNH (David Mackay)	23/05/14	***Red-throated diver*** We consider that survey data from 2010 and 2012 are more relevant than the older observations from 2003, 2004 and 2007. Flight lines may have changed over the years; tree growth and changes in prey abundance could, for instance, affect this. 2010 and 2012 are the only years in which diver watches were carried out from VP11; close to loch 64 and affords views over most of the water surface. Vantage points used in other years were very far from optimal given their extended distance from loch 64 and impairment of views by trees. A significant proportion of diver flights may have been missed, especially from VPs other than VP11. We disagree with the assertion that 2012 – the year of proven breeding at loch 64 – represents an 'infrequent or anomalous pattern of use'. We do not agree that surveys carried out for Strathy North and Strathy Wood tells us anything specific about flight activity, flight lines or collision risk at loch 64. There is no empirical evidence that flight line corridors are an effective mitigation measure for red-throated divers at wind farms. Corriemoillie is mentioned as using such corridors as mitigation, but this is a site where red-throated divers were not a qualifying feature of a Special Protection Area (SPA), and there is less need for certainty of effectiveness. We do not recommend that 'collision risk clarifications for turbine deletion scenarios' are undertaken. Existing data do not support this depth of analysis. Insufficient dedicated vantage point survey has been undertaken for loch 64 which	As highlighted, the Applicant considers sufficiently comprehensive data are already presented in the 2013 ES addendum but fieldwork was undertaken in 2014 breeding season and is reported in Section 5 and 6. Furthermore, the scope for inter-annual variation accounts for the Applicant's use of the 2003 to 2012 span of data in the 2013 ES Addendum. The 2014 work further demonstrates that use of Loch 64 is infrequent or anomalous, in accordance with the evidence presented in the 2013 ES Addendum. The Applicant has proposed a range of practical and appropriate measures to further reduce risk of collision, by managing the use of Loch 64, should reduction of any

TABLE 3.1 – CONSULTATION SUMMARY			
Consultee	**Date**	**Consultee Comment**	**Further information, including how comments have been dealt with**
		places little confidence in the flight lines presented as providing a comprehensive picture of diver movements. Diver flights would normally be expected to be between the breeding loch and the coast, but the flights presented for loch 64 deviate from this normal pattern. It is therefore not possible to provide advice on turbine deletion as mitigation. Additional vantage point work to inform a robust assessment of flight activity rates and flight directions for loch 64 should be carried out. We acknowledge that loch 64 is not used in every year by breeding red-throated divers, so further survey work may not be of help unless the divers are present.	risk be considered necessary.
		Greenshank The 800m buffer: The figure of 800m is used by Hancock (1997) as a minimum separation distance between greenshank pairs, and looking at the greenshank territory registrations, mean separation distances appear to fall within this distance band. Secondly, and perhaps more importantly, flight activity is marked (even accounting for distance detection) out to about 1,000m. We reiterate that the buffer is not a displacement distance. We accept that limited evidence suggested that greenshank show limited avoidance of turbines, but this may make them more vulnerable to collision. We have argued in our letter of 30 April that issues surrounding distance detection mean that flight activity is under-recorded. We fully understand why an attempt has been made to correct for this. The method is, in principle, sound but as we pointed out in the meeting held on 25th April, the nature of the correction for observer effect depends on the form of the distance detection function and the assumption that this follows a half-normal distribution does not necessarily hold true for all species. It is argued that the low level of flight activity is a result of habitat effects but no substantive evidence is provided to that effect. At the meeting on 25th April we explained that for the magnitude of the reduced reduction in flight activity near to VPs, the habitat effects needed to be reasonably consistent between VPs, yet there was no good evidence that this was the case. In contrast the strong effect shown is consistent with other studies showing observer effects (e.g. whimbrel in Shetland). In addition the idea that activity might increase close to an observer due to attraction (we assume) is flawed. We do not believe that the distance effect detected (using the Generalized Linear Mixed Model analysis) can be solely attributed to habitat or topography effects, but are more likely to rest on displacement due to the surveyor. The arguments presented rest on the conclusion from Collision Risk Modelling that greenshank collisions will be sufficiently low (i.e. rare) and therefore the SPA population will not be affected. However, this understates the importance of the following: That collision risk estimated may be considerably underestimated both alone and in combination with other plans and projects across the SPA. That the habitat around Strathy South forest includes some of the best wader breeding habitat with high densities of all species, including greenshank. Using RPS data, it is calculated that in 2010 16 greenshank territories lie within 800m of the nearest turbine (any one territory centre may be within 800m of more than one turbine). In 2012 the comparable figure is 15 greenshank territories. By comparison, at Achany in 2003, up to four pairs of greenshank were found to breed close to the proposed development site. That numbers quoted for both the original SPA and the subsequent monitoring are hedged with large confidence intervals which only suggest that the population may be stable or possibly increasing.	The possible buffer distance of 800m was again queried, along with the origin of the 1000 m flight activity distance. Meeting with SNH requested to seek clarification. Meeting was held 21/10/2014 and further clarification is awaited from SNH as a follow-up action.

TABLE 3.1 – CONSULTATION SUMMARY			
Consultee	**Date**	**Consultee Comment**	**Further information, including how comments have been dealt with**
		That a careful consideration of all the conservation objectives for the SPA for greenshank as a qualifying interest, do not show, beyond reasonable doubt, that the integrity of the SPA will not be adversely affected. We would be happy to consider any new information relating to impacts on red-throated diver and greenshank arising from the proposed development at Strathy South, which would cause us to revise our assessment of the likely impacts.	

4 DEVELOPMENT DESCRIPTION

The proposed development consists of the following key elements:

- Wind turbines;
- Foundations and hard standing;
- Access track and site tracks;
- Stream crossings;
- Cabling;
- Anemometer masts;
- Control building/Switching station;
- Welfare building;
- Lay down areas; and
- Borrow pits.

Those elements of the proposals where amendments are made as a result of the reduction in turbine numbers to 39, which are also relevant to the assessment of impacts on red-throated diver and greenshank, are described in the paragraphs below. Figure 1 shows the T39 Layout and associated infrastructure.

4.1 Turbines

The T39 Layout (Figure 2) results from the removal of eight turbines from the Modified 2013 Scheme (Figure 1), specifically T51, T55, T62, T63, T68, T73, T74 and T76.

The National Grid References (NGR) for the turbines proposed for retention are presented in Table 4.1.

TABLE 4.1 – T39 LAYOUT TURBINE LOCATIONS

TURBINE NUMBER	X CO-ORDINATE	Y CO-ORDINATE
1	280619	953031
2	281155	952737
4	280687	952437
6	281205	952237
8	280675	951871
9	281141	951618
10	280139	951650
11	280653	951295
13	280144	951050
15	281058	950872
17	280598	950707
18	281049	950334
19	280030	950461
20	280413	950162
22	279973	949829
24	280781	949792
26	280279	949361
28	279786	949085
29	279022	950112
30	279413	949703
33	279165	949159
35	277397	949254
36	278217	949225
39	277866	949638
41	277431	949983
42	278375	949964
43	278763	949581
45	278263	950529
46	278855	950613
49	277856	951064
47	278555	951001
50	278264	951400
52	277806	951652
57	278737	951687

TABLE 4.1 – T39 LAYOUT TURBINE LOCATIONS		
TURBINE NUMBER	**X CO-ORDINATE**	**Y CO-ORDINATE**
56	278297	951962
61	279119	952086
69	278372	953507
70	278683	953059
72	279165	953538

As set out in Section A4.2.4: Micrositing of Chapter A4: Development Description of the 2013 ES Addendum, it is proposed that an allowance of up to 50m would be permissible for turbines and infrastructure.

Turbine parameters remain unchanged for the T39 Layout compared to the Modified 2013 Scheme:

- maximum tip height 135m;
- maximum modelled rotor diameter 104m; and
- maximum modelled hub height 83m.

4.2 Anemometers

Four permanent anemometry masts were proposed as part of the Modified 2013 Scheme (Figure 1). However, with the removal of turbines it is proposed that that the permanent anemometry mast located in the northwest part of the site is removed, reducing the total number of permanent anemometry masts required to three (Figure 2).

4.3 Design Evolution since the 2013 ES Addendum

Following additional consultation, as described in Section 3 of this report, the number of turbines has been reduced from 47 to 39, resulting in a maximum capacity output of 132.6 MW compared to 159.8 MW for the Modified 2013 Scheme. The turbines listed below were removed for the following reasons:

- T51 has been removed to mitigate effects on wood sandpiper;
- T55, T62 and T63 have been removed to mitigate effects on breeding black-throated diver;
- T68, T73, T74 have been removed for two reasons: to mitigate effects on breeding black throated diver and on low flying military aircraft; and
- T76 has been removed to mitigate effects on low flying military aircraft.

This means that no wind farm infrastructure would be installed inside the northwest section of the red line boundary, leaving this entire area available for full habitat restoration.

4.4 Habitat Mitigation and Enhancement

The T39 Layout includes the removal of the northwest permanent anemometry mast, and scope to remove existing forestry track. This results in freeing the entire north-western part of the site for habitat restoration. Further to the 2013 ES Addendum, following finalisation of land management agreements, implementation of grazing management has also been secured over an additional 1,306ha of land offsite, in the Caithness and Sutherland Peatlands SPA. Within this area, two areas of search have been identified for additional drain blocking, comprising Peat Restoration Search Area A - 115.4 ha, or Peat Restoration Search Area B - 89.9 ha. These latter enhancement measures will be of additional potential benefit to greenshank by increasing the extent of wetland habitat. In addition, the agreement also secures locations for diver rafts. The total Peatland Restoration and Management area therefore proposed comprises approximately 3,200 ha; 1,600 ha onsite, the 1,306ha above, and a further 300 ha off site, previously considered in the 2013 ES Addendum.

5 2014 BREEDING SEASON FIELDWORK

5.1 Introduction

Following deletion of the eight turbines in response to MoD and SNH consultation responses, SNH nonetheless still considers there to be issues regarding potential collision effects for red-throated divers and greenshank. Whilst the Applicant considers that data in the 2013 ES Addendum, along with subsequent clarifications, are sufficiently comprehensive for the assessment, further targeted survey work was completed in 2014. This was undertaken to provide ongoing insights into flight activity and breeding distribution of red-throated diver in particular.

The comprehensive surveys carried out at Strathy South between 2003 and 2012 are reported in Volume 4: Technical Appendices, Technical Appendix A11.1 of the 2013 ES Addendum.

The flight activity and breeding diver walkover survey details for 2014 are presented in this section.

5.2 Flight Activity (Vantage Point; VP) Surveys

5.2.1 Introduction

VP surveys were conducted during May 2014 to August 2014 by RPS.

These surveys were undertaken to update the Collision Risk Model (CRM) with 2014 data, which was also recalculated to account for the reduction in turbine numbers of the T39 Layout (Section 7). Bird flight activity and breeding does vary between years, and the increased time span of data is informative. The 2014 flight activity information is also useful in understanding distribution and use of breeding territories.

As well as the standard VP surveys, additional diver-specific VP surveys were also carried out in 2014, which overlooked utilised lochans and focused on recording diver activity.

As recommended by SNH[1], VPs were selected with the aim of providing maximum visibility of the site with the minimum number of points, whilst also avoiding the positioning of VPs near to sensitive sites and hotspots for target species.

Details of all VP locations used in 2014 are presented in Table 5.1 and Figures 3, 4, 5 and 6, including viewsheds at 0m and 20m. A summary of VP surveys carried out, temporal spread and records of flights from these surveys are presented in Appendices 1, 2 and 3 respectively. Details of VP positions and viewsheds used in 2003, 2004, 2007, 2010 and 2012 are provided in Technical Appendix A11.1 of the 2013 ES Addendum.

TABLE 5.1 – SUMMARY OF VANTAGE POINT SURVEY COVERAGE 2014

VP Number	Diver VP	Easting	Northing	View bearing
3		279530	948458	10
9	[X]	277228	951420	270
14	[X]	281729	949103	110
15		277254	954630	135
16		279755	954165	195
17		277252	951516	15
18		277300	951218	135
19		279405	951970	120
20		279798	951735	285
21		281782	950996	270
26	[X]	276066	953624	285
44	X	277296	948687	0
45	[X]	277813	956440	270
46	X	279619	947392	100
47	X	278532	952716	165
48	[X]	274562	950469	60
49	[X]	276889	956841	270
50	[X]	275957	956475	0
51	[X]	277232	956769	220

TABLE 5.1 – SUMMARY OF VANTAGE POINT SURVEY COVERAGE 2014				
VP Number	**Diver VP**	**Easting**	**Northing**	**View bearing**
52	[X]	276817	956999	30

Notes:
Diver VPs are marked by an X. Those in brackets signify no overlap between 2km viewshed and wind farm polygon.

5.2.2 Survey Methodology

Surveys were undertaken in light of the contemporary SNH methodology[1].

Each flight activity survey was undertaken by a single observer in conditions of good visibility. Surveyors positioned themselves as inconspicuously as possible to minimise their effects on the birds' natural behaviour. In addition, care was taken to ensure an even temporal spread of survey effort where possible so that flight activity was recorded throughout different parts of the day during the survey season.

During each flight activity survey, the landscape within a 180° arc from the VP was continuously scanned until a target species (swans, geese, divers, waders and raptors) was detected. Once detected, the focal bird was observed until it landed or flew out of sight. The time of first detection was noted, and its flight height band was recorded for each 15 second period that the bird was in view. The area surveyed (the 'viewshed') was limited to within 2km of the VP as recommended by SNH[1].

Surveys generally lasted three hours. On a single occasion, the survey period during a diver VP was longer. A summary of each VP survey undertaken in 2014 and its duration is presented in Appendix 1, and a visual representation of temporal variation of surveys from each VP is presented in Appendix 2.

Five height bands were used: 0-20m (below rotor height); 20-40m and 40-100m (at rotor height); and 100-150m and 150m+ (above rotor height).

The paths of all observed flights were drawn as accurately as possible onto 1:10,000 scale maps in the field. Flight lines of target species were then digitised and compiled into a GIS, while the associated flight duration and height data were entered into a linked Microsoft Access database. These details were then fed into the CRM process.

5.2.3 Survey Effort

The focus of survey effort in 2014 was to further examine flight activity and breeding diver distribution during the core breeding season, in particular given the lack of diver presence on Loch 64.

The number of hours of survey carried out at each VP during the 2014 breeding season and broken down by month is presented in Table 5.2.

The times that VP surveys occurred relative to sunrise and sunset times, split by VP, are presented in Appendices 1 and 2.

TABLE 5.2 – TOTAL NUMBER OF HOURS SURVEY EFFORT AT EACH VP DURING 2014						
VP Number	**Diver VP**	**May**	**Jun**	**Jul**	**Aug**	**Total**
3		6	17	12	12	47
9	[X]	0	0	12	6	18
14	[X]	0	2	0	0	2
15		9	12	12	12	45
16		9	9	12	12	42
17		0	12	15	12	39
18		3	12	9	15	39
19		0	9	12	12	33
20		3	15	9	15	42
21		3	9	12	12	36

[1] SNH (2014) *Recommended bird survey methods to inform impact assessment of onshore wind farms*. [online] Available at: http://www.snh.gov.uk/docs/C278917.pdf [Accessed: 23rd September 2014].

TABLE 5.2 – TOTAL NUMBER OF HOURS SURVEY EFFORT AT EACH VP DURING 2014						
VP Number	**Diver VP**	**May**	**Jun**	**Jul**	**Aug**	**Total**
26	[X]	0	12	24	15	54
44	X	0	6	12	12	30
45	[X]	0	15	26	3	44
46	X	0	3	6	0	9
47	X	0	9	0	0	9
48	[X]	0	0	27	17	44
49	[X]	0	0	0	5	5
50	[X]	0	0	3	6	9
52	[X]	0	0	7	0	7
Total		33	141	210	169	552

Notes:
Diver VPs are marked with an "X" in "Diver VP" column. Those also marked in brackets signify no overlap between 2km viewshed and wind farm polygon.

5.2.4 Survey Results

Flight lines of red-throated diver and greenshank recorded during the 2014 VP surveys, along with incidental records and those recorded during diver VPs (red-throated diver only) are presented in Figures 7 and 8 respectively.

Data covering all individual flights recorded by red-throated diver and greenshank in 2014 are provided in Appendix 3.

A summary of all flight activity data for red-throated diver and greenshank, recorded from VPs during 2014 is shown in Table 5.3.

TABLE 5.3 – FLIGHT ACTIVITY DATA RECORDED FROM VANTAGE POINTS DURING 2014					
Species	**Season**	**No. birds recorded**	**- of which at PCH***	**- of which at PCH, within wind farm and within 2km of VP**	**Number of flights at PCH, within wind farm and within 2km of VP**
Greenshank	Wader breeding 2014	30	8	4	2
Red-throated Diver	Diver breeding 2014	16	13	0	0

Notes:
*PCH: Potential Collision Height

In 2014, seven red-throated diver flights comprising 16 birds were recorded during standard VP surveys. Of these, only two red-throated diver flights, comprising three birds, were recorded within the red line boundary. These flights were not recorded at PCH. The flights recorded outside the red line boundary were predominantly observed to the northwest of the site, with a single flight observed to the northeast of the red line boundary.

In addition, a further 66 red-throated diver flights were recorded to the northwest of the site, outside the red line boundary, during dedicated diver VPs. These flights displayed a pattern suggesting that birds in that area may preferentially travel to the north coast in a north-westerly direction, as opposed to a north-easterly route. The former is a shorter route to the sea by c2km across open moorland.

In total, 17 greenshank flights comprising 30 birds were recorded from VP surveys during 2014. Eight of these birds (comprising five flights) were recorded at PCH, with four birds over two flights recorded at PCH inside the red line boundary, although these records were made at the eastern extremity of the site. Of the greenshank observations outwith the red line boundary, 12 flights were clustered to the pools northwest of the site.

5.3 Breeding Diver Walkover Surveys

5.3.1 Survey Methodology

Breeding diver walkover surveys were undertaken based on the methodologies specified in Gilbert et al.[2]. A more intensive programme of visits was carried out in order to gain a more in depth understanding of breeding and non-breeding birds on site, based on egg laying and chick rearing periods.

The 2014 surveys covered at least a 2 km buffer around the red line boundary, with the exception of the area to the northeast of the red line boundary, which is the subject of a data sharing agreement between the Applicant, the landowner and EON (developers of the Strathy Wood wind farm), which was set up to avoid unnecessary duplication of effort. All lochs, lochans and pool systems within the identified buffer, outwith the data sharing zone, were surveyed for red-throated diver.

All known and suspected breeding lochs or lochans were surveyed the most intensively, whilst all other lochs, lochans and pool systems were walked past/through or scanned from suitable vantage points. Observations at the latter sites were also supplemented by observations from other surveys.

A suspected breeding site was defined as any loch or lochan on which red-throated divers have been seen during previous surveys but not confirmed breeding. For the purposes of the 2014 surveys, the chick-rearing period ran from 15th July to 30th August. At least two further visits were made in this period, even if breeding was not confirmed earlier in the season.

Breeding was considered possible if a bird was present at the same location on both visits. Records of single birds in suitable breeding habitat, but showing no obvious breeding behaviour were considered non-breeders and are therefore not included in the breeding totals.

5.3.2 Survey Effort

The egg laying period for red-throated diver was considered to run from 1st June – 15th July. This egg laying period was then sub-divided into three shorter periods 1st - 15th June (visit 1), 16th -30th June (visit 2) and 1st -15th July 2012 (visit 3).

The dates on which surveys were carried out are presented in Table 5.4.

TABLE 5.4 – DATES OF BREEDING DIVER SURVEYS AT STRATHY SOUTH

Year	Red-throated diver
2014	27th /28th /29th /31st May 1st /2nd /11th /12th /13th June 16th /17th /23rd /24th /25th /26th June 2nd /14th July 31st July 3rd /7th /17th /19th /20th August

5.3.3 Survey Results

Observations of red-throated divers recorded during the breeding diver survey are presented in Figure 7.

[2] Gilbert, G. Gibbons, D. W, and Evans, J. (1998). Bird Monitoring Methods. RSPB, Bedfordshire.

6 AUTOMATED CAMERA DATA COLLECTION AT LOCH 64

6.1 Introduction

During extensive consultation between the Applicant and SNH, issues have been raised by SNH relating to red-throated diver (Section 3), focussing on gauging the frequency of their presence and breeding frequency on Loch 64. In the previous five years of monitoring at Strathy South (2003, 2004, 2007, 2010, 2012), Loch 64 has only had one red-throated diver breeding attempt recorded there, in 2012. This attempt was unsuccessful.

Other SNH issues relating to red-throated divers are set out in Table 6.1.

TABLE 6.1 – DATES OF BREEDING DIVER SURVEYS AT STRATHY SOUTH

Concern	Source
"The number of days on which fieldwork was carried out, particularly regarding the periods of high diver activity around dawn and dusk, were too small to be representative"	SNH response to 2013 ES Addendum, 20/11/2013
"The amount of effort centred on one of the breeding lochs (Loch 64) does not meet survey guidelines for the number of hours of dedicated watches. The two survey years for which the best data exist are 2010 and 2012. In 2010, vantage point (VP) 11 spans part of the season and amounts to 12 hours in June and 20 hours in July. In 2012 at VP 11, there were 9 hours in June and 3 hours in July. We consider that there are insufficient hours to establish an accurate level of flight activity and the directions in which birds flew, to and from feeding locations. Checking the other VPs used to establish flight directions and movements suggests that these VPs would be likely to miss a significant proportion of diver flights into and out of the loch."	SNH response to 2013 ES Addendum, 30/04/2014

The Applicant is in disagreement with SNH over the sufficiency of survey coverage and the frequency of use of the lochan by this species, and is of the view that the data presented in the 2013 ES Addendum is already sufficient for the assessment. Nonetheless, the 2014 survey work was completed to provide further insight into use of this lochan by red-throated divers, as part of wider monitoring of breeding distribution.

Specifically, given issues over the previous VP coverage of Loch 64, an automated camera was deployed to assist in assessing red-throated diver activity there. VP watches carried out from VPs 17, 20 and 47 also contained Loch 64 within the 2 km viewshed.

6.2 Methodology

The camera was positioned on an existing fencepost near the shore of Loch 64, at position NC 2856595 952411. The camera faced approximately north-northeast and was elevated approximately 2 m from ground level.

The camera was deployed between 26th April 2014 and 10th September, the latter being the date when the entire Strathy South area was known, from field observations, to be clear of breeding red-throated divers. The camera was programmed to take an image every 5 minutes, and was visited to retrieve data approximately once a month during the survey period.

Images were assessed manually for the presence of red-throated divers.

6.3 Results

During the period in which the camera was deployed at Loch 64, 26,809 images were captured between sunrise and sunset.

Red-throated divers were only recorded in photographs from Loch 64 on one day out of the 137 days it was deployed; 18th May 2014. A pair of birds were present in images collected between 12:05 and 15:00. This represents 36 photos, or 0.13% of those taken during the 2014 breeding season.

An example photo of the pair is shown at the end of this section, which also demonstrates the viewshed of the camera.

6.4 Discussion

These data, coupled with a lack of records (visual or aural) from various field surveys confirm that red-throated divers did not breed, or attempt to breed, at Loch 64 during 2014. Based on the timing of their visit, the pair seen in photos on the 18th May were either feeding, loafing or prospecting the site as a potential breeding location. However, no breeding behaviour was recorded, and it is therefore evident that the pair relocated elsewhere.

The data collected here provides evidence for a further year of limited use of Loch 64 by red-throated divers. Of the seven years of data collected at Strathy South, only 2012 has seen activity levels consummate with a breeding attempt at Loch 64.

7 COLLISION RISK MODELLING

7.1 Introduction

This section contains details of the collision risk modelling (CRM) used to predict estimated bird collisions for the T39 Layout, using the methodology advocated by SNH[3].

The CRM analysis was implemented in the Python programming language[4] and utilised ArcGIS and PostgreSQL/PostGIS relational database management system[5].

Outputs from CRM at Strathy South have been included in a cumulative assessment along with other nearby developments, as per SNH's cumulative impact spreadsheet provided in October 2014 (Section 9.7).

7.2 Choice of Directional or Non-directional Models

For each target species, a collision rate was estimated using either a directional or non-directional collision risk model. The choice of modelling method was based on the flight behaviour of the species of interest within the proposed wind farm area following the guidance provided in SNH[4].

7.3 Definitions: the Wind Farm Polygon, Risk Area, Risk Window and Risk Volume

The area of analysis is defined as the wind farm polygon. Commonly this is determined as the boundary around the extremities of the turbines (technically referred to as a convex hull; see Section 7.4).

A flight selection polygon for each vantage point was defined as the overlap of the viewshed (the polygon of theoretical visibility) with the wind farm polygon buffered by 200m (this buffer is applied to accommodate spatial imprecision of field mapping (see SNH[6])).

The risk volume is defined as the volume of airspace over the wind farm polygon at rotor height and is used in non-directional models (SNH[4]).

The rotor-swept volume is defined as the total volume of air swept by all of the rotors in the wind farm. For an individual rotor this is determined by the area swept (πr^2) multiplied by the thickness of the rotor blades, plus the length of the focal species (SNH 2000).

The risk window is defined as a line that bisects the wind farm across the mean direction of travel of the relevant species through the wind farm polygon (SNH 2000; but also see "Calculation of the number of rotor transits" for red-throated diver below). This measure is used in the directional model.

7.4 Determining Wind Farm Polygons for Analysis

SNH does not provide standard guidance on defining the extent of the wind farm polygon. For wind farms with simpler turbine layout than at the proposed Strathy South wind farm (such as, for example, Strathy North), this is less of an issue, because turbines are distributed within a regular shape, and it is therefore relatively straightforward to define the area enclosed by the tips of the outermost turbine rotors (i.e. the convex hull of the extremities of turbines). However, where

[3] SNH (2000) *Windfarms and birds: Calculating a theoretical collision risk assuming no avoiding action*. [online] Available at: http://www.snh.gov.uk/docs/C205425.pdf [Accessed: 30 May 2013].
[4] Python.org (2013) *Python Programming Language – Official Website*. [online] Available at: http://python.org/ [Accessed: 30 May 2013].
[5] Postgresql.org (2013) *PostgreSQL: The World's most Advanced open source database*. [online] Available at: http://www.postgresql.org/ [Accessed: 30 May 2013].
[6] SNH (2010) *Survey methods for use in assessing the impacts of onshore windfarms on bird communities*. [online] Available at: http://www.snh.gov.uk/docs/C278917.pdf [Accessed: 30 May 2013].

proposed turbines present an irregular shape, such as Strathy South, a convex hull would (a) fail to preserve the shape of the development and (b) result in areas of potentially unrepresentative habitat being included in the analysis.

As the proposed turbines at Strathy South form such an irregular shape and are surrounded by highly differing habitats (forest plantation versus open moorland), an algorithmic solution was therefore used to help define an appropriate wind farm polygon. The resulting polygons used are shown in Figure 9, and preserve the distinctive 'U' shape of the proposed development and exclude the unrepresentative habitat of Yellow Bog.

7.5 Parameters

Parameters used in the CRM are provided in Tables 7.1 and 7.2. Morphometric measurements for bird species were taken from BTO.org[7] with flight speeds from Alerstam et al.[8] or alternatively from Bruderer and Boldt[9]. Turbine specifications are from Senvion.com[10] except blade pitch, which varies during operation and the value of 10° presented here is taken from knowledge of Siemens turbines.

TABLE 7.1 – CRM TURBINE TECHNICAL PARAMETERS

Parameter	Measurement	Units
Number of turbines	39	
Blades per turbine	3	
Hub Height	83	Metres
Rotor Radius	52	Metres
Maximum Chord	3.8	Metres
Pitch	10	Degrees
Rotation Period	4.35	Seconds
Proportion Operational	0.85	

TABLE 7.2 – BIOMETRIC PARAMETERS USED IN CRM

Parameter	Greenshank	Red-throated diver
Bird Length (m)	0.32	0.61
Wingspan (m)	0.69	1.11
Bird Speed (m/s)	12.3	18.6
Avoidance Rate	0.98	0.98
Months Active	1st April – 31st July	1st May – 15th September
Flight Style	Flapping	Flapping

For red-throated diver, the breeding season was taken as 1st May to 15th September. For greenshank, the breeding season was between 1st April and 31st July. These time periods are based on information given by SNH[1] and/or local knowledge of the site.

7.6 Calculation of Effort

The zone of theoretical visibility to 20m above ground level was calculated to a maximum distance of 2,000m from each VP using ESRI's ArcGIS Spatial Analyst extension with Ordnance Survey's Panorama digital terrain data[11] (Figure 4). For each vantage point the area of visible extent within the wind farm polygon was multiplied by the sum of observed time to give effort in terms of time observed per unit area.

[7] BTO.org (2013) *Welcome to BirdFacts | BTO - British Trust for Ornithology*. [online] Available at: http://www.bto.org/about-birds/birdfacts [Accessed: 23rd September 2014].
[8] Alerstam T, Rosén M, Bäckman J, Ericson PGP, Hellgren O (2007) Flight speeds among bird species: Allometric and phylogenetic effects. PLoS Biol 5(8): e197. doi:10.1371/journal.pbio.0050197.
[9] Bruderer, B. and Boldt, A. (2001), Flight characteristics of birds:. Ibis, 143: 178–204. doi: 10.1111/j.1474-919 X.2001.tb04475.x.
[10] Senvion.com*: Wind Power Solutions - Wind Turbines - 3.XM - 3.4M104*. [online] Available at: http://www.senvion.com/fileadmin/user_upload/02_WindPowerSolutions/DataSheets/Senvion_3.4M104_Datasheet_EN.pdf [Accessed: 23rd September 2014].
[11] Ordnance Survey (2013) *Land-Form PANORAMA - small-scale height data of Great Britain*. [online] Available at: http://www.ordnancesurvey.co.uk/oswebsite/products/land-form-panorama/index.html [Accessed: 23rd September 2014].

7.7 Selection of Flights for Inclusion

Flights were selected or excluded from the analysis according to the following rules:

- Flights were rejected from the analysis if they were wholly over 2km from their respective vantage point;
- Flights must have intersected their respective flight selection polygon (Figure 9) and have been observed in a height band that overlaps with turbine rotor height (bands 2, 3 and 4).

7.8 Birds Using the Wind Farm Airspace: Waders

7.8.1 Time at Potential Collision Height

For each flight selected by the process described in Section 7.7, the time observed at each height band was adjusted by multiplying by the proportion of overlap of the height band with the turbine rotors. These times were then summed to give a value of time at potential collision height (PCH) for each flight. This value was adjusted by multiplying by the proportion of the flight's length within the flight selection polygon to give an estimate of time at PCH within the wind farm polygon.

7.8.2 Rate of Bird Activity

Time at PCH within the wind farm polygon was summed for each species at each vantage point. Rate of activity, in terms of seconds per hour per km^2, was calculated by dividing by the vantage point's respective effort.

From these values a single rate for the wind farm polygon was derived by summing the product of the rate of activity and the proportion of effort at each vantage point.

7.8.3 Calculation of the Number of Rotor Transits

The number of transits of the rotor was calculated following the method described in SNH[4]. The potentially active time period was assumed to be daylight hours which were calculated using the CBM model described in Forsythe[12].

7.8.4 Probability of Collision of a Single Transit

The probability of collision of a single rotor transit was calculated following SNH[4]. Turbine specifications are presented in Table 7.1. Morphometric measurements are presented in Table 7.2.

7.8.5 Calculation of Number of Collisions

The estimated number of collisions was determined by combining the estimated number of rotor transits with their probability of collision, an assumed 85% turbine operational rate, and the avoidance rate specified in SNH[13].

7.9 Regular Flights Through a Wind Farm: Divers

7.9.1 Rate of Bird Activity

For each vantage point the number of birds from flights selected for inclusion in analysis was summed. A rate of activity in terms of birds per hour per km^2 was calculated by dividing this value by the vantage point's respective effort.

[12] Forsythe, W.C., Rykiel Jr., E.J., Stahl, R.S., Wu, H. and Schoolfield, R.M. (1994). A model comparison for daylength as a function of latitude and day of year. Ecological Modelling 80:1, pp.87-95.
[13] SNH (2010) *Use of Avoidance Rates in the SNH Wind Farm Collision Risk Model*. [online] Available at: http://www.snh.gov.uk/docs/B721137.pdf [Accessed: 23rd September 2014].

From these values a single rate for the wind farm polygon was derived by summing the products of the rate of activity and the proportion of effort at each vantage point.

7.9.2 Calculation of the Number of Rotor Transits

The number of rotor transits was calculated following the method described in SNH[4]. The potentially active time period was assumed to be daylight hours plus 25% of night time hours to accommodate crepuscular activity, which were calculated using the CBM model described in Forsythe[12].

The "risk window" described in SNH[4] was determined by calculating the circular mean and standard deviation of the angles of flight lines (from start to end point). A standard deviation of less than 0.5 indicated a true pattern of flight direction and the risk window was calculated across the wind farm polygon perpendicular to the circular mean direction. If the standard deviation was greater than or equal to 0.5, no clear orientation of flights was evident and the risk window length was calculated as the mean of the bounding box dimensions of the wind farm polygon.

7.9.3 Probability of Collision of a Single Transit

The probability of collision of a single rotor transit was calculated following SNH[4]. Morphometric measurements are presented in Table 7.1; turbine specifications are presented in Table 7.2.
5.

7.9.4 Calculation of Number of Collisions

The estimated number of collisions was determined by combining the estimated number of rotor transits with their probability of collision, an assumed 85% turbine operational rate, and the avoidance rate specified by SNH[13].

7.10 Calculation of Collision Risk: Red-throated Diver

7.10.1 Red-throated Diver Survey Effort

In 2014, a total of 325 hours of effort was applied during VP surveys from the same eight positions utilised during the 2012 surveys. Over 36 hours of survey effort was carried out from each VP with the exception of VP 19. A breakdown of hours at each VP is provided in Table 5.2.

The duration of flight activity surveys used for the CRM is shown in Table 7.3, and this information is also shown from 2007 to 2012 for comparative purposes. This is in addition to the earlier survey effort completed in 2003 and 2004, during which a total of 275.5 hours of flight activity survey effort was made during the diver breeding season.

TABLE 7.3 – TOTAL VANTAGE POINT HOURS DURING THE DIVER BREEDING SEASON (MAY TO SEPTEMBER INCLUSIVE)

Vantage Point (VP)	2007	2010	2012	2014
1*	60.00	34:30	-	-
2*	47:55	42:00	-	-
3*	58:05	42:00	57:00	46:30
4*	52:55	31:00	-	-
[D1]	-	-	-	-
D2	-	-	-	-
5	28:30	36:00	-	-
6	27:00	44:00	-	-
[7]	-	-	-	-
8	-	-	-	-
[9]	-	-	-	-
[10]	-	-	-	-
11	-	-	-	-
12	-	-	-	-
13	-	-	-	-
[14]	-	-	-	-
15	-	-	48:00	45:00
16	-	-	48:00	42:00
17	-	-	60:00	38:30

TABLE 7.3 – TOTAL VANTAGE POINT HOURS DURING THE DIVER BREEDING SEASON (MAY TO SEPTEMBER INCLUSIVE)				
Vantage Point (VP)	**2007**	**2010**	**2012**	**2014**
18	-	-	54:00	39:00
19	-	-	48:00	33:00
20	-	-	54:00	42:00
21	-	-	48:00	39:00
24	-	-	-	-
25	-	-	-	-
[26]	-	-	-	-
TOTAL	**276:25**	**229:30**	**417:00**	**325:00**
Notes: Diver VPs are shaded grey, with those which have no overlap with the wind farm polygon in brackets.				

A total of 276 hours and 25 minutes of flight activity survey effort was made from six VPs during the 2007 diver breeding season.

In 2010, a total of 229 hours and 30 minutes of surveys were undertaken from six VPs. Effort ranged from 31 to 44 hours per VP during the diver breeding season.

In 2012, flight activity surveys were undertaken from eight VPs to give a total observation time of 417 hours. At least 45 hours of survey was carried out at each VP.

7.10.2 Red-throated Diver Flight Activity and Collision Risk

The overall results from 2007 to 2014 show that the majority of flight activity recorded for red-throated divers was associated with breeding lochans to the west and northeast of the wind farm area (i.e. outside the red line boundary of the site), with only a small proportion crossing the wind farm area at any point (Figure 7, Figures A11.1.47-51, 2013 ES Addendum).

In total, between 2007 and 2014, a total of 119 red-throated divers were recorded in flight during the standard VP surveys (Table A11.1.61, Technical Appendix A11.1, Volume 4: Technical Appendices, 2013 ES Addendum). Over this period, there were generally either no flights, or only a small proportion of flights, 'at-risk' (i.e. at PCH and within the red line boundary). The exception was in 2012, when red-throated divers were present on Loch 64, in the northwest of the site. This naturally led to an increase in flight activity for that year, with 29 of 44 flights crossing the 'at risk' area. This level of flight activity was, however, not representative of the overall pattern, and given the low level of flight activity recorded across the site for most years, there were only sufficient numbers of 'at-risk' flights to model from 2007 and 2012.

In 2014, the vast majority of the red-throated diver flights were recorded to the northwest of the site. It should be noted that the area to the northeast of the site was not surveyed for reasons given in Section 5.3.1. These flights displayed a pattern suggesting that birds in that area travel to the north coast in a north-westerly direction, as opposed to a north-easterly route. The former is a shorter route to the sea by c2km across open moorland. Only two red-throated diver flights were recorded within the red line boundary, which is not sufficient for CRM analysis to be triggered, in accordance with the approach used during the 2007 ES and 2013 ES Addendum.

The collision risk predictions for the Modified 2013 and T39 layout, including results for 2014, are provided in Tables 7.4 and 7.5 (the former for comparison). As for the 2013 ES Addendum, the modelling uses the direction collision risk model, a 98% avoidance rate, and an assumed wind farm operation time of 85%.

The average collisions over 2007, 2010, 2012 and 2014 for the T39 Layout was therefore **0.14 red-throated divers a year, equivalent to approximately 3-4 birds over the 25-year lifetime of the proposed wind farm**. This compares with 0.23 collisions per year or 5-6 birds over the 25-year wind farm lifetime for the Modified 2013 Scheme**.**

Taking into account data from 2003 and 2004, which indicated zero collision risk, the red-throated diver collision rate for the T39 Layout drops to 0.09 collisions per year, or 2-3 birds over the life of the wind farm. This compares to 0.16 collisions per year, or 4 birds over the life of the wind farm for the Modified 2013 Scheme.

There is emerging evidence from operational sites that divers avoid wind farms[14]. A study of the Smola wind farm in Norway showed that red-throated divers completely avoided flying through an area of an island where a wind farm array had been constructed. If birds avoid the wind farm, collision risk is, by definition, zero. The predicted collision rates modelled for Strathy South are therefore considered to be precautionary.

TABLE 7.4 – PREDICTED RED-THROATED DIVER COLLISION RISK FROM 2007 TO 2014 VP RESULTS: MODIFIED 2013 SCHEME (T47)

Collision Risk Modelling	2003*	2004*	2007	2010	2012	2014	Mean
Predicted collisions per year	0	0	0.35	0	0.58	0	0.23
Equivalent to 1 bird every X years	N/A	N/A	2.9	N/A	1.7	N/A	N/A
Predicted number of collisions over 25 years	0	0	7.5	0	14.5	0	5.5

Notes:
*2003 and 2004 CRM outputs are provided for information. They are not included in the means or any subsequent calculation or discussion.

TABLE 7.5 – PREDICTED RED-THROATED DIVER COLLISION RISK FROM 2007 TO 2014 VP RESULTS: T39 LAYOUT

Collision Risk Modelling	2003*	2004*	2007	2010	2012	2014	Mean
Predicted collisions per year	0	0	0.08	0	0.46	0	0.14
Equivalent to 1 bird every X years	N/A	N/A	12.5	N/A	2.2	N/A	N/A
Predicted number of collisions over 25 years	0	0	2	0	11.4	0	3.4

Notes:
*2003 and 2004 CRM outputs are provided for information. They are not included in the means or any subsequent calculation or discussion.

7.10.3 Collision Risk for Red-throated Diver in the Context of Regional and SPA Populations

For the citation of the Caithness and Sutherland Peatlands SPA, the population of breeding red-throated divers was estimated to be 89 pairs[15], of 'Favourably Maintained' status. The population was estimated to represent 9.5% of the UK population. Based on the CRM data for 2007 to 2014, the number of collisions predicted over the lifetime of the T39 Layout represents 1.91% of this SPA population estimate, compared to 3.09% of the SPA population for the Modified 2013 Scheme. The number of collisions predicted as a result of the T39 Layout therefore represents 0.36% of the UK population quoted in the SPA Citation[15].

Following the population estimates given in the more recently published Dillon et al.[16], a number of population estimates can be applied to the CRM outputs. The number of collisions predicted for the T39 Layout over the lifetime of the wind farm represents 3.70% of the red-throated diver population estimate of 46 breeding pairs[17] for the Caithness and Sutherland Peatlands SPA, compared with 5.98% for the Modified 2013 Scheme. However, it is estimated that an additional 97 birds are present at the SPA during the breeding season as non-breeders[16]. If these birds are factored into the calculations (to give a total of 189 birds in the SPA), the number of collisions with the T39 Layout over the lifetime of the wind farm represents 1.80% of the population, compared to 2.91% for the Modified 2013 Scheme.

The number of red-throated diver collisions predicted over the lifetime of the T39 Layout represents 0.88% of the population estimate of 227 breeding pairs in mainland Scotland (corrected after Gomersall et al.[17]), compared with 1.32% for the Modified 2013 Scheme. Expressed relative to the 2006 national breeding population estimate of 1143 pairs, collisions over the lifetime of the T39 Layout represent 0.15% of the national population.

Adding in CRM results from 2003 and 2004 to mean predicted collision rates from 2007 to 2014 results in the further reduction of these percentage impacts.

[14] Halley, D.J. and Hopshaug, P. 2007. Breeding and overland flight of red-throated divers *Gavia stelleta* at Smola, Norway, in relation to the Smola wind farm. NINA Report 297, 26pp.
[15] Special Protection Area (SPA) Citation. The Caithness & Sutherland Peatlands, Highland (UK9001151). Under European Community Directive 79/409 on the Conservation of Wild Birds "Birds Directive".
[16] Dillon, I.A., Smith, T.D., Williams, S.J., Haysom, S. & Eaton, M.A. (2009). Status of Red-throated Divers *Gavia stellata* in Britain in 2006. Bird Study 56: 147-157.
[17] Gomersall, C.H., Morton, J.S. & Wynde, R.M. 1984. Status of breeding Red-throated Divers in Shetland, 1983. Bird Study 31: 223–229.

7.11 Calculation of Collision Risk: Greenshank

7.11.1 Greenshank Survey Effort

In 2014, a total of 221 hours of effort was applied during VP surveys from eight positions during the wader breeding season.

The duration of flight activity surveys used for the CRM is shown in Table 7.6, and this information is also shown from 2007 to 2012 for comparative purposes. This is in addition to the earlier survey effort completed in 2003 and 2004, during which a total of 216 hours of flight activity survey effort was made during the wader breeding season. The collision risk for each year for the Modified 2013 Scheme was calculated to be zero and 0.02 collisions per year respectively.

TABLE 7.6 – TOTAL VP HOURS DURING THE WADER BREEDING SEASON (APRIL TO JULY INCLUSIVE)

Vantage Point (VP)	2007	2010	2012	2014
1	51:00	34:30	-	-
2	46:55	42:00	-	-
3	52:05	42:00	51:00	35:00
4	47:55	31:00	-	-
5	12:00	36:00	-	-
6	12:00	34:00	-	-
15	-	-	42:00	33:00
16	-	-	42:00	30:00
17	-	-	54:00	27:00
18	-	-	48:00	24:00
19	-	-	42:00	21:00
20	-	-	48:00	27:00
21	-	-	43:00	24:00
TOTAL	**221:55**	**219:30**	**367:00**	**221:00**

A total of nearly 222 hours of flight activity survey effort was made during the 2007 breeding season from 6 VPs, with 45 hours or more survey effort per VP. The exceptions were VPs 5 and 6, which were observed for 12 hours each. These VPs were only added later in the 2007 breeding season.

In 2010, a total of almost 220 hours of surveys were undertaken from six VPs, with at least 31 hours undertaken from each VP.

In 2012, flight activity surveys were undertaken from eight VPs, and at least 42 hours per VP was surveyed.

7.11.2 Greenshank Flight Activity and Collision Risk

With no obvious directionality of flights, a non-directional CRM was deemed appropriate for predicting collision risk for this species.

Over the 2007 and 2014 period, a total of 138 greenshank flights were recorded during flight activity surveys (Table A11.1.61, Technical Appendix A11.1, Volume 4: Technical Appendices, 2013 ES Addendum). Of these, 33 flights were 'at-risk' (defined as being within the red line boundary at potential collision risk height), with the majority occurring in 2012. It was considered that sufficient numbers of 'at-risk' flights were available for modelling during all survey periods except 2014, when only two flights were observed within the red line boundary (Figure 8), which in accordance with the approach used during the 2007 ES and 2013 ES Addendum is an insufficient number of flights to trigger CRM.

The predicted number of greenshank collisions over the risk zone during the 2007 to 2014 breeding seasons is given in Table 7.8 for the T39 Layout, which can be compared with figures for the Modified 2013 Scheme in Table 7.7. An avoidance rate of 98% has been used, which is recommended by SNH[13] for this species. An 85% operational time has also been assumed.

For the T39 Layout, CRM predicted a mortality rate of between 0 and 0.02 birds per breeding season from the 2007 to 2014 data (Table 7.8). This is an average of **0.01 collisions per year, or less than one bird over the 25-year lifetime of the proposed wind farm, or one bird every**

100 years. This compares to a mortality rate of between 0 and 0.07 for the same time period for the Modified 2013 Scheme (Table 7.7), which also equates to less than 1 bird over the wind farm lifetime. Although it has not been presented, the collision risk output for 2003 and 2004 was zero, which would further reduce the mean collision risk for the T39 Layout to 0.02 collisions per year for the Modified 2013 Scheme, or 0.005 collisions per year for the T39 Layout. Both are equal to considerably less than a single collision over the lifetime of the wind farm.

TABLE 7.7 – PREDICTED GREENSHANK COLLISION RISK FROM 2007 TO 2014 VP RESULTS: MODIFIED 2013 SCHEME (T47)

Collision Risk Modelling	2003*	2004*	2007	2010	2012	2014	Mean
Predicted collisions per year	0	0.02	0.04	0.01	0.07	0	0.04
Equivalent to 1 bird every X years	N/A	50	25	100	14	N/A	N/A
Predicted number of collisions over 25 years	0	0-1	1	0	1-2	0	0-1

Notes:
*2003 and 2004 CRM outputs are provided for information. They are not included in the means or any subsequent calculation or discussion.

TABLE 7.8 – PREDICTED GREENSHANK COLLISION RISK FROM 2007 TO 2014 VP RESULTS: T39 LAYOUT

Collision Risk Modelling	2003*	2004*	2007	2010	2012	2014	Mean
Predicted collisions per year	0	<0.02	0	0.02	0.01	0	0.01
Equivalent to 1 bird every X years	N/A	>50	N/A	50	100	N/A	N/A
Predicted number of collisions over 25 years	0	0-1	0	0-1	0-1	0	0-1

Notes:
*2003 and 2004 CRM outputs (for which 2004 is estimated based on the output of the CRM for the Modified 2013 Scheme) are provided for information. They are not included in the means or any subsequent calculation or discussion.

7.11.3 Distance Detection Corrected Collision Risk Estimates for Greenshank

As it has been previously considered by SNH that predicted levels of activity using the data gathered from flight activity surveys may under-record actual levels of greenshank flight activity, distance detection correction has been applied to CRM outputs to generate an adjusted new value, with an additional degree of precaution is therefore included. These methods have already been presented to SNH and as such are not detailed here, though correspondence is available in Appendix 4. With the adjustment applied, and when the 2007 to 2014 CRM data are considered, **the predicted collision rate is 0.06 collisions per year for the T39 Layout. This is equivalent to 1-2 collisions over the 25 year life of the wind farm**. The corresponding values for the Modified 2013 Scheme are 0.15 collisions per year and 3-4 over the life of the wind farm.

7.11.4 Collision Risk for Greenshank in the Context of the SPA Population

SNH has maintained concerns over certainty in the adjusted predictions for greenshank. Where such issues arise over uncertainty, a useful approach applied elsewhere for wind farm applications (for instance in post-submission consultation for the Galawhistle wind farm), has been to apply different multipliers to CRM outputs. This allows potential effects on the most recent greenshank population estimate of the Caithness and Sutherland Peatlands SPA to be explored, which is 653 pairs[18]. Furthermore, the current status of the breeding greenshank population as an SPA feature is described as 'Favourable Maintained'[19]. Such multipliers are provided in Table 7.9 with respect to the outputs for the T39 Layout, for CRM outputs from 2007 to 2014.

The Applicant considers that even if SNH retains an element of concern about the adjusted predicted collision rates, the 'what if' multiplier scenarios demonstrate that there is more than sufficient additional scope for effects to be accommodated without significant effects on greenshank as a component of the Caithness and Sutherland Peatlands SPA.

[18] Bellamy, P.E. & Eaton, M.A. (2009). 2009 CSM bird monitoring of Caithness and Sutherland Peatlands SPA. RSPB contract report to Scottish Natural Heritage.
[19] SNH Site Condition Monitoring Form, Caithness and Sutherland Peatlands SPA. Feature Name: Greenshank.

TABLE 7.9 – PREDICTED GREENSHANK COLLISION RISK (BASED ON 2007 TO 2014 CRM OUTPUTS) RELATIVE TO CAITHNESS AND SUTHERLAND PEATLANDS POPULATION ESTIMATE, USING A RANGE OF MULTIPLIERS, FOR THE T39 LAYOUT

CRM Multiplier	CRM Multiplier %	T39 Layout					
		Predicted collisions per year		Predicted collisions over 25 years		% of SPA population (653 pairs)[18]	
		Non-distance Corrected	Distance Corrected	Non-distance Corrected	Distance Corrected	Non-distance Corrected	Distance Corrected
1x	N/A	0.01	0.06	0-1	1-2	0.02%	0.11%
2x	100%	0.02	0.12	0-1	3	0.04%	0.23%
5x	500%	0.05	0.30	1-2	7-8	0.10%	0.57%
10x	1000%	0.10	0.60	2-3	15	0.19%	1.15%
20x	2000%	0.20	1.20	5	30	0.38%	2.30%
25x	2500%	0.25	1.50	6.25	37-38	0.48%	2.87%
30x	3000%	0.30	1.80	7-8	45	0.57%	3.45%
40x	4000%	0.40	2.40	10	60	0.77%	4.59%
50x	5000%	0.50	3.00	12-13	75	0.96%	5.74%
87x	8700%	0.87	5.24	21-22	130-131	1.67%	10.03%

As highlighted, in addition to precautionary assumptions included in the standard CRM, and added to by the precautionary elements in the CRM adjusted for any distance detection effects, the multipliers demonstrate that potential impacts of exaggerated collision rates have no adverse effect on site integrity.

8 POPULATION AND TERRITORY ANALYSIS OF GREENSHANK

8.1 Introduction

Extensive correspondence between the Applicant and SNH has occurred following the submission of the 2013 ES Addendum (Section 3 and Appendix 4). SNH maintained an objection to the 2013 Modified Scheme; this objection has also been maintained in relation to the revised T39 layout, which includes concerns relating to the possible impact on greenshank. Based on the position taken by SNH, a number of approaches to further inform the current status of greenshanks around Strathy South are outlined in Table 8.1, along with the corresponding section of this report in which they are addressed.

The methods described in Sections 8.3 and 8.4 utilise greenshank registration data collected in 2010 and 2012. The records collected in these years are presented in Figures 10 and 11.

TABLE 8.1 – POINTS TO BE ADDRESSED BY GREENSHANK SECTIONS IN THIS REPORT

Point	Section Number
Summary of approach used in 2013 ES Addendum	8.2
Estimation of greenshank numbers around Strathy South using the methods of Hancock et al. (1997)	8.3
Estimation of greenshank numbers around Strathy South using the methods of Bellamy and Eaton (2009)	8.4
The rationale of the use of an 800m buffer around greenshank territories to reduce collision risk to an acceptable level	No provision of advice for allocation of putative greenshank territories by SNH
The SPA greenshank population	8.5
Previously accepted greenshank displacement distance	8.6

8.2 Approach Used in 2013 ES Addendum

Section 2.1.7 of Technical Appendix A11.1, Volume 4: Technical Appendices of the 2013 ES Addendum describes the breeding wader survey data available and the approaches used to determine numbers of breeding greenshank pairs, territories and territory distribution in the vicinity of Strathy South. SNH has sought clarification of the derivation of territory centres and breeding distribution in its correspondence (Appendix 4). This is provided in Sections 8.3 and 8.4.

For the 2007 surveys and subsequent analysis, a two visit Moorland Breeding Bird Survey (MBBS) was employed. Greenshanks were included in the breeding totals if they showed particular behaviours characteristic of breeding or if a bird was present at the same location on both survey visits. Birds recorded in suitable habitat in a particular location on one visit only, and which did not show obvious breeding behaviour, were not included.

In 2010 and 2012, four MBBS survey visits were undertaken across the open habitat within the survey area (which extended out to 1 km from the red line boundary). In addition, there were targeted greenshank surveys at all lochans, pool systems and boggy areas within the Strathy South forest. The dates of these surveys are presented in Table 8.2.

The 2010 and 2012 survey data were used to determine the numbers of territories and distances of registrations at the ‘centre’ of these territories to the nearest proposed turbines.

8.3 Approaches of Hancock, Gibbons and Thompson (1997)

8.3.1 Introduction

SNH's references to the three approaches proposed by Hancock et al.[20] to estimate numbers and territory centres of greenshank resulted in work presented in the RPS letter to SNH of 17th February 2014. The methods are applied to data collected in 2010 and 2012. This work is re-presented here in greater detail to provide clarity on the methodology employed.

It should be noted that none of the methods proposed by Hancock et al.[20] deal with the issue of identifying putative territory centres and determining how many territories occur within different distances of the proposed turbines, for which there is no published method.

8.3.2 Surveys Included in this Analysis

In 2010 and 2012, two types of survey aimed at recording breeding greenshank were carried out. Visits utilising the MBBS method covered the open ground around Strathy Forest. The breeding greenshank surveys (BG) took place within Strathy Forest. When combined, the surveys were judged to cover the entire development site plus a 1km buffer.

MBBS

The methodology for the 2010 and 2012 MBBS is detailed in the 2013 ES Addendum.

Breeding Greenshank Surveys

The breeding greenshank surveys consisted of two approaches:

1. **Location of greenshank hotspots:** These were either nest sites, feeding areas or chick rearing areas within Strathy Forest plus a 1km buffer. This was based on information from previous year's surveys as well as walkover searches of bogs and pools around Strathy Forest.
2. **Recording of activity at hotspots:** Once identified, a series of VP-style surveys overlooking known hotspots to record greenshank activity.

In approach 1, the location and activities of all greenshank seen or heard were recorded, including behaviour and flight lines of the birds, any broods seen, or any behaviour indicative of breeding such as adults' alarm calling or exhibiting mobbing or distraction behaviour. Where possible, male/female individuals were identified, and it was determined whether these were new birds or previously recorded birds that had moved position.

For approach 2, as soon as a greenshank activity 'hotspot' was located a suitable VP location was established within 1km of the hotspot. Appropriate temporal variation was applied to these watches. Flexibility in the abandonment of hotspots, if activity was short-lived (e.g. if the territory is only occupied for courtship), aimed to maximise the amount of activity recorded.

8.3.3 Survey Effort

Survey dates in 2010 and 2012 are summarised in Table 8.2. As full coverage of the site was achieved with both survey methods when combined, four complete monthly visits were completed in each year.

[20] Hancock, M. H., Gibbons, D. W., & Thompson, P. S. 1997.The status of breeding Greenshank (*Tringa nebularia*) in the United Kingdom in 1995. Bird Study 44: 290-302.

TABLE 8.2 – DATES OF MBBS & BG SURVEYS AT STRATHY SOUTH, 2010 AND 2012					
Survey Period	Visit	2010		2012	
		MBBS	BG	MBBS	BG
1	Visit 1 (April)	19th, 21st, 23rd, 26th	13th, 22nd, 27th	15th – 18th	16th
	Visit 2 (May)	6th, 7th, 10th, 24th – 27th	17th – 19th	14th – 17th	14th – 15th
2	Visit 3 (June)	2nd, 9th, 10th, 11th, 17th, 23rd, 30th	6th, 14th, 17th , 18th, 21st, 22nd	18th – 21st	18th
	Visit 4 (July)	6th, 9th, 12th, 13th	2nd, 15th, 21st, 22nd	15th – 17th, 19th	16th

Inclusion of Incidental Records

As well as the records included in the MBBS and BG surveys throughout 2010 and 2012 (see Table 8.2), a number of incidental records were also included in the datasets used to estimate greenshank breeding population and territory estimates. These records were recorded during diver walkover surveys and are presented in Table 8.3.

TABLE 8.3 – SUMMARY OF GREENSHANK INCIDENTAL RECORDS INCLUDED IN POPULATION AND TERRITORY ESTIMATES FOR 2012	
Date	Record Notes
05/06/2012	Alarm calling pair with chick
13/06/2012	Alarm calling pair with chicks
19/06/2012	Alarm calling pair with chicks
02/07/2012	Alarm calling pair with chicks
10/07/2012	Alarm calling pair with fledged chick
12/07/2012	Alarm calling pair with fledged chick
17/07/2012	Alarm calling pair with fledged chick

8.3.4 Methodology and Results

The methods of Hancock et al.[20] were based on each survey area being surveyed twice during the timeframe 10th April to 10th July. The period 10th April to 25th May (survey period 1) was defined as the period before egg laying, whilst 26th May to 10th July (survey period 2) was defined as the chick rearing period.

Within each period, a nominal high detectability period was also defined; 16th April to 8th May for period 1 and 1st June to 23rd June for period 2. Hancock et al.[20] states that at least one of the two visits to each survey area should occur within a high detectability period. It can be seen that good temporal coverage of high detectability periods was achieved in both 2010 and 2012.

The 2010 and 2012 dataset contained four visits rather than the recommended two. Outputs for a two visit methodology are presented alongside the four visit methodology. The visits that were selected were visit 1 from survey period 1 and visit 3 from survey period 2, which coincided with the largest proportion of the high detectability periods in 2010 and 2012.

Any adaptations to the methods in Hancock et al.[20] due to the increased number of visits are explained in the following sections.

Population Estimation from a Peak Count of Adults

All greenshank records were included to give a precautionary estimate of a peak count of adults, which was taken to be the largest single visit count over the course of each year. No attempt was made to remove any duplicate records during this method. The results are presented in Table 8.4 for the two visit methodology, and Table 8.5 for the four visit methodology.

TABLE 8.4 – TOTAL NUMBER OF GREENSHANK REGISTRATIONS IN 2010 AND 2012; 2 VISIT METHOD								
Survey Period	Visit	2010			2012			
		MBBS	BG	Total (Pairs)	MBBS	BG	DivWO	Total
1	Visit 1 (April)	31	12	43 (21-22)	8	4	0	12 (6)
2	Visit 3 (June)	11	10	21 (10-11)	28	4	3	35 (17-18)

TABLE 8.5 – TOTAL NUMBER OF GREENSHANK REGISTRATIONS IN 2010 AND 2012; 4 VISIT METHOD								
Survey Period	Visit	2010			2012			
		MBBS	BG	Total (Pairs)	MBBS	BG	DivWO	Total
1	Visit 1 (April)	31	12	43 (21-22)	8	4	0	12 (6)
	Visit 2 (May)	25	1	26 (13)	11	3	0	14 (7)
2	Visit 3 (June)	11	10	21 (10-11)	28	4	3	35 (17-18)
	Visit 4 (July)	21	2	23 (11-12)	28	1	4	33 (15-16)

Therefore, the peak count of adults in 2010 was estimated to be 21-22 pairs and 17-18 pairs in 2012. The peak estimate of adults is the same for the two visit methodology as for the four visit methodology.

Population Estimation from a Count of Broods

Any adults encountered during survey period 2, which were alarm calling, were assumed to be accompanying broods. Numbers are presented for both years in Tables 8.6 (two visit method) and 8.7 (four visit method).

TABLE 8.6 – TOTAL NUMBER OF GREENSHANK BROODS IN 2010 AND 2012; 2 VISIT METHOD								
Survey Period	Visit	2010			2012			
		MBBS	BG	Total	MBBS	BG	DivWO	Total
1	Visit 1 (April)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Visit 3 (June)	2	4	6	5	0	3	8
Note: N/A means that visits from survey period 1 are not included in this estimate, as per Hancock et al.[20]								

TABLE 8.7 – TOTAL NUMBER OF GREENSHANK BROODS IN 2010 AND 2012; 4 VISIT METHOD								
Survey Period	Visit	2010			2012			
		MBBS	BG	Total	MBBS	BG	DivWO	Total
1	Visit 1 (April)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Visit 2 (May)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Visit 3 (June)	2	4	6	5	0	3	8
	Visit 4 (July)	13	1	14	17	0	4	21
Note: N/A means that visits from survey period 1 are not included in this estimate, as per Hancock et al.[20]								

For the four visit methodology, whilst the total count of alarm calling adults in survey period 2 across both visits in 2010 was 20, there were three records deemed to be likely duplicates, in the Yellow Bog area at approximately NC 279412 950670. Therefore the total of alarm calling adults (and therefore broods) for the four visit methodology in 2010 was 12.

There were judged to be no duplicate records for the two visit methodology in 2010. Therefore this method recorded 6 broods.

Likewise in 2012, 6 records occurred close together in the Yellow Bog area, which have been interpreted as a single brood. In addition, two records in the vicinity of Loch 157, at approximately NC 280261 948389, on the same day, have also been interpreted to be a single brood.

Furthermore, five records in the vicinity of NC 278515 952444 recorded during the diver walkover surveys across June (3 records) and July (2 records) were considered to represent a single brood.

Therefore, the total of alarm calling adults (and therefore broods) for 2012 was 20.

The number of broods in 2012 according to the two visit methodology was judged to be 6, as the June duplicates described above were treated as a single brood.

Population Estimation from a Count of Breeding 'Territories'

This is a slightly more complex approach, and involves the use of a distance of 800m around registrations to assign territories. Firstly, all broods from the 'Population Estimation from a Count of Broods' approach above were included. An 800m buffer was applied to each of these. Where multiple records were interpreted to be the same brood the 800m buffers were dissolved to form a single territory. All registrations from survey period 1 of birds' alarm calling in the first period, or singing or copulating in either period were examined. Any which fell within any of the territories derived by step 1 were discarded. Those that remained had an 800m buffer applied to them. Any of the non-discarded records from step 2, which had overlapping buffers, were treated as a single additional territory.

The results from this method are presented in Tables 8.8 and 8.9 (two visit and four visit method respectively). For the two visit methodology, the number of territories present within 1km of the wind farm was 11 in 2010 and 10 in 2012. For the four visit methodology, the territory numbers were 15 and 22.

TABLE 8.8 – TOTAL NUMBER OF GREENSHANK TERRITORIES; 4 VISIT METHOD

Survey Period	Visit	2010				2012			
		Broods	Outwith Brood Territories		With Overlap	Broods	Outwith Brood Territories		With Overlap
			Alarm Calling	Singing	Total (inc broods)		Alarm Calling	Singing	Total (inc broods
1	Visit 1 (April)	N/A*	10	7	5 (11)	N/A*	2	0	2 (10)
2	Visit 3 (June)	6	N/A**	2		8	N/A**	1	

Note:
N/A* means that broods were not estimated in survey period 1, as per Hancock et al.[20]
N/A** means that alarm calling birds in survey period 2 have been included as brood count, as per Hancock *et al*.[20]

TABLE 8.9 – TOTAL NUMBER OF GREENSHANK TERRITORIES; 4 VISIT METHOD

Survey Period	Visit	2010				2012			
		Broods	Outwith Brood Territories		With Overlap	Broods	Outwith Brood Territories		With Overlap
			Alarm Calling	Singing	Total (inc broods)		Alarm Calling	Singing	Total (inc broods
1	Visit 1 (April)	N/A*	3	6	3 (15)	N/A*	2	0	2 (22)
	Visit 2 (May)		0	1			2	0	
2	Visit 3 (June)	12	N/A**	2		20	N/A**	0	
	Visit 4 (July)			0				0	

Note:
N/A* means that broods were not estimated in survey period 1, as per Hancock et al.[20]
N/A** means that alarm calling birds in survey period 2 have been included as brood count, as per Hancock *et al*.[20]

8.4 Approach of Bellamy and Eaton (2009)

8.4.1 Introduction

The SNH Commissioned Report "2009 CSM bird monitoring of Caithness and Sutherland Peatlands SPA"[18] provided an updated assessment of the total population of the Caithness and Sutherland Peatlands SPA for a number of bird species, including greenshank. The work utilised two methods for estimating the greenshank population; a minimum pairs estimate and a best estimate of population[18]. Both methods were used to generate estimates for the 2010 and 2012 data, in order to provide population estimates for the Strathy South area that could be compared directly with the population estimates for the wider SPA, enabling comment on the relative importance of the area around the proposed wind farm for greenshank.

8.4.2 Methodology and Results

Minimum Pairs Estimate

Birds were confirmed as breeding if they were observed singing or displaying, were observed in territorial disputes, repeatedly alarm called or performed distraction displays indicating proximity to nest or young, or if a nest, eggs or young were located.

Firstly, observations of any birds not showing breeding or territorial behaviour were removed, the remaining observations were assumed to relate to independent territories unless noted as possibly the same bird or pair by the surveyors, or the behaviour and/or distance between two observations were indicative of them relating to the same bird or pair. The territories were counted as the same if observations were less than 500 m apart. Where there was more than one observation judged to belong to the same territory, the location used for the visit summary map was the midpoint of the mapped locations.

The species summary maps for the two visits were then overlaid in a GIS to give a total estimate of the breeding population by identifying which breeding locations were the same between visits and any that were different and hence likely to relate to different territories. The total population index for each species was the number of breeding locations on the first visit plus any new breeding locations from the second visit. Breeding locations were considered separate between the two visits only if more than 1000 m apart.

The working behind this methodology is presented in Table 8.10. The minimum pairs estimate of greenshank for 2010 and 2012 was 19 and 15 respectively.

TABLE 8.10 – MINIMUM PAIRS ESTIMATE WORKING

Year	Breeding Registrations in Visit 1	Number of Centroids in Visit 1	Breeding Registrations in Visit 2	Number of Centroids in Visit 2	Number of Visit 2 Centroids >1000m from Visit 1 Centroids	Minimum Pairs Estimate
2010	31	16	21	15	3	19
2012	11	7	32	12	8	15

'Best Estimate' of Population

In addition to the breeding criteria used in the Minimum Pairs Estimate, all other records were accepted as indicating breeding unless they were on loch shores. A buffer of 50 m was applied to each loch and any bird within it was deemed to be on the shoreline. The 50 m buffer was selected to account for errors originating from the size of the registration on the map, and the location of the registration on the map relative to the actual position of the bird. The outputs using this method are summarised in Table 8.11.

TABLE 8.11 – BEST ESTIMATE WORKING

Year	Minimum Pairs Estimate	Total Non-Breeding Registrations	Total Non-Breeding Registrations <50m from Loch	Best Estimate (Pairs)
2010	19	60	36	31
2012	15	52	31	26

Therefore the 'best estimate' method for greenshank within 1km of the red line boundary generated 31 pairs in 2010 and 26 pairs in 2012.

8.5 Greenshank Population Estimation in Relation to the SPA Population

8.5.1 Summary of Results

A summary of the figures derived from each of the methods of Hancock et al.[20] and Bellamy and Eaton[18], plus the figures derived in the 2013 ES Addendum are presented in Table 8.12.

TABLE 8.12 – SUMMARY OF GREENSHANK POPULATION ESTIMATES

Year	Hancock et al.[20]					Bellamy and Eaton[18]		2013 ES Addendum
	Peak Count (pairs)	Count of broods		Count of breeding territories		Minimum Pairs Estimate	Best Estimate (pairs)	
Number of Visits	Two and four	Two	Four	Two	Four	Four	Four	Four
2010	21-22	6	12	11	15	19	31	26
2012	17-18	8	20	10	22	15	25-26	27

The highest result in both years was derived using the 'best estimate' method from Bellamy and Eaton[18].

8.5.2 Current Status of Greenshank Population in Caithness and Sutherland Peatlands SPA

According to the JNCC's citation for the Caithness and Sutherland SPA, the source of which are surveys carried out in 1994/5, the SPA supports 256 pairs of greenshanks during the breeding season[21].

Updated population estimation by Bellamy and Eaton[18] has resulted in a revised figure of 653 (389-917) pairs of greenshanks within the Caithness and Sutherland SPA.

The population of greenshank in the Caithness and Sutherland SPA has been increasing steadily since the mid-1990s[18], with surveys in 2009 suggesting that 16 of the 17 SSSIs reached the greenshank breeding density threshold on resurvey plots compared to data collected in 2004[18]. The current condition of the greenshank population as an SPA feature is 'Favourable Maintained'[19].

8.5.3 Greenshank Population Estimates for Strathy South in Relation to SPA Population

Tables 8.13 and 8.14 present the numbers of greenshank occurring within 1km of the red line boundary as established by the methods of Hancock et al.[20] and Bellamy and Eaton[18], expressed as a percentage of the cited SPA population and revised SPA population (with upper and lower confidence intervals) according to Bellamy and Eaton[18].

TABLE 8.13 – SUMMARY OF GREENSHANK POPULATION ESTIMATES WITHIN 1 KM OF THE RED LINE BOUNDARY EXPRESSED AS % OF SPA CITATION POPULATION ESTIMATE

Year	Hancock et al.[20]					Bellamy and Eaton[18]		2013 ES Addendum
	Peak Count (pairs)	Count of broods		Count of breeding territories		Minimum Pairs Estimate	Best Estimate (pairs)	
Number of Visits	Two and four	Two	Four	Two	Four	Four	Four	Four
2010	8.6%	2.3%	4.7%	4.3%	5.9%	7.4%	12.1%	10.2%
2012	7.0%	3.1%	7.8%	3.9%	8.6%	5.9%	10.2%	10.5%

[21] JNCC.defra.gov.uk. [online] Available at http://jncc.defra.gov.uk/default.aspx?page=1855 [Accessed 29th October 2014].

TABLE 8.14 – SUMMARY OF GREENSHANK POPULATION ESTIMATES WITHIN 1 KM OF THE RED LINE BOUNDARY EXPRESSED AS % OF SPA POPULATION ESTIMATE AS PER BELLAMY AND EATON SITE CONDITION MONITORING (2009)								
Year	Hancock et al.[20]					Bellamy and Eaton[18]		2013 ES Addendum
	Peak Count (pairs)	Count of broods		Count of breeding territories		Minimum Pairs Estimate	Best Estimate (pairs)	
Number of Visits	Two and four	Two	Four	Two	Four	Four	Four	Four
2010	3.4% (2.4-5.7)	0.9% (0.7-1.5)	1.8% (1.3-3.1)	1.7% (1.2-2.8)	2.3% (1.6-3.9)	2.9% (2.1-4.9)	4.7% (3.4-8.0)	4.0% (2.8-6.7)
2012	2.8% (2.0-4.6)	1.2% (0.9-2.1)	3.1% (2.2-5.1)	1.5% (1.1-2.6)	3.4% (2.4-5.7)	2.3% (1.6-3.9)	4.0% (2.8-6.7)	4.1% (2.9-6.9)

8.6 Greenshank Displacement Distance

To assess the number of greenshank at possible risk of displacement, a 200 m buffer plus the 52 m blade length, was applied to each turbine, and all records outside these buffers excluded due to them being beyond the range at which displacement is a risk. This 200 m buffer is derived from two sources, specifically the SNH response to the 2007 Strathy South ES (2nd October 2007, which relates specifically to the Caithness and Sutherland Peatlands SPA), and the other is the precognition for the since consented and constructed Achany wind farm by Des Thompson of SNH (2009)[22].

A summary of these results is presented in Table 8.15.

TABLE 8.15 – SUMMARY OF GREENSHANK POPULATION ESTIMATES, INCLUDING ONLY RECORDS WITHIN 200 M PLUS 52 M BLADE LENGTH OF ANY TURBINE					
Year	Hancock et al.[20] – 4 visit method			Bellamy and Eaton[18]	
	Peak Count (pairs)	Count of broods	Count of breeding territory centres	Minimum Pairs Estimate	Best Estimate (pairs)
2010	0-1	0	0	0	2
2012	0	0	0	0	0

[22] Thompson, D. (2009). Proposed wind farm development at Achany Estate, Lairg, Sutherland; Proposed Wind Farm Development at Beinn Rosail, Strath Oykel, Invercassley, Sutherland, Ornithology. Summary Precognition for Public Local Inquiry.

9 ASSESSMENT OF EFFECTS OF THE T39 LAYOUT ON RED-THROATED DIVER AND GREENSHANK, UPDATING THE CONCLUSIONS OF THE 2013 ES ADDENDUM

9.1 Introduction

The purpose of this section is to provide an understanding of how the environmental effects arising from the T39 Layout compare with those described in the 2013 ES Addendum for the Modified 2013 Scheme, and how the reduction in turbine numbers (and the associated reduction in on-site tracks) for the T39 Layout compares to the impacts presented for the Modified 2013 Scheme in Chapter A11: Birds of the ES Addendum on greenshank and red-throated diver. The implications of the data collected during the 2014 breeding season are also considered.

In addition, this section provides consideration of the cumulative effects in relation to relevant wind farms. The relevant cumulative wind farms are those in closest proximity to the site i.e. Strathy North (consented), Strathy Wood (submitted to planning; the 2013 ES Addendum was based on the scoping layout current at the time of submission), and Betty Hill. Following discussions with SNH (October 2014), additional data would be desirable; however, this has not been received so the assessment has proceeded to use the data available at the time of writing.

9.2 Basis of Assessment & Development Characteristics

The assessment of the effects of the Original 2007 Scheme on all Valued Ornithological Receptors (VORs) previously identified is presented in Chapter 11: Birds, Section 10.6: Assessment of Potential Effects of the 2007 ES. Changes to the effects arising from the Modified 2013 Scheme on these VORs compared to the Original 2007 Scheme are highlighted in Chapter A11: Birds, Section A11.5: Changes to Effects Evaluation of the 2013 ES Addendum.

The development characteristics of the Modified 2013 Scheme used to assess impacts on VORs are presented in Chapter A4: Development Description of the 2013 ES Addendum. The differences between the Modified 2013 Scheme and the T39 Layout, which are judged to be relevant to the scope of this report, are summarised in Section 4 of this report.

9.3 Impacts to be Assessed

All VORs identified in the 2007 ES, and subsequently re-examined in the 2013 ES Addendum remain relevant. In light of SNH's current position, only red-throated diver and greenshank are considered in this report.

A summary of the predicted impacts, mitigation and residual impacts of the T39 Layout is presented in Table 9.1 for red-throated diver and Table 9.2 for greenshank. Where changes have been made from the same table presented in the 2013 ES Addendum these are highlighted in yellow.

9.4 Red-throated Diver

9.4.1 Summary of Additional Information Report

The 2014 survey data for red-throated diver shows a pattern of use outside the red line boundary to the northwest of the site, and that flight activity within the red line boundary is very low. This represents similar activity to that observed in all years except 2012, when a breeding attempt at Loch 64, within the red line boundary, resulted in an increase in recorded flight activity. The fact that a further survey year has passed without such a level of flight activity within the proposed wind farm area itself provides additional evidence that 2012 was an anomalous and infrequent pattern of red-throated diver flight activity, as concluded in the 2013 ES Addendum.

Survey effort of Loch 64 was extensive in 2014. Two VPs (17 and 20) recorded 51 hours of observation on this Loch, with an additional 9 hours from VP 47; no red-throated diver flights associated with Loch 64 were recorded. The deployment of an automated camera at Loch 64 during the 2014 breeding season detected a pair of red-throated divers for a period of approximately three hours on a single day in May, suggesting that whilst the loch was perhaps considered as a potential breeding site, it was rejected. This provides further evidence that whilst there is a possibility that breeding could occur on Loch 64 in the future, it does not represent an optimal breeding location. It is likely that this pair will have attempted to breed elsewhere, outwith the red line boundary.

The observation that Loch 64 is not regularly used for breeding reduces the level of disturbance that could be expected during the construction and operation of the proposed wind farm, as it is likely the breeding pair recorded will not be attempting to breed on Loch 64 (as has been the case without the proposed wind farm being present). Loch 64 is located in excess of 500 m from the nearest proposed turbine.

The reduced number of turbines associated with the T39 Layout results in a reduction in the collision risk for red-throated diver (Tables 7.4 and 7.5), from 0.23 collisions per year (5 to 6 birds over 25 years) to 0.14 (3 to 4 birds over the same period). This represents 0.88% of the population estimate of 227 breeding pairs for the Scottish Mainland[16] for the T39 Layout, compared with 1.32% for the Modified 2013 Scheme. When expressed as a percentage of the Caithness and Sutherland Peatlands SPA population of 189 adults[16], the number of collisions due to the T39 Layout represents 1.85% of this estimated population.

9.4.2 Revised Impacts on Red-throated Diver

The impacts of the T39 Layout on red-throated diver are presented, as with the 2013 ES Addendum, as a summary of information to inform the Appropriate Assessment. This can be found in Table 9.3. Where changes have been made to the assessment presented in Table A11.6 of the 2013 ES Addendum, these are highlighted in yellow.

9.5 Greenshank

9.5.1 Summary of Additional Information Report

The 2014 flight activity surveys showed low activity within the red line boundary for 2014. Combined with previously collected MBBS data, it is evident that despite the fact that greenshank use the habitat outwith the red line boundary, the current use of the area in which turbines are proposed is limited in comparison.

The reduced number of turbines associated with the T39 Layout results in a reduction in the collision risk for greenshank (Tables 7.7 and 7.8), from 0.04 collisions per year (0 to 1 birds over 25 years) to 0.01 (also 0 to 1 birds over the same period). This represents 0.002% of the population estimate of 653 breeding pairs for the Caithness and Sutherland SPA for the T39 Layout, the same as for the Modified 2013 Scheme. Adjusted figures are also presented to include and a multiplication to account for any underestimation which shows that in order for a collision rate to account for 1% of the Caithness and Sutherland SPA population, it would have to be around 8x higher than predicted when distance detection is also accounted for (Table 7.9).

Appropriate published methods have been applied to greenshank registrations from 2010 and 2012 in order to establish the number of territories in the area around Strathy South. The figures generated were broadly similar to those produced in the 2013 ES Addendum. It has been calculated that around 4% of the greenshank territories within the Caithness and Sutherland SPA are within 1 km of the Strathy South red line boundary. However, previous work and advice given by SNH suggests that the displacement distance for greenshank is much lower than this (200m). When this disturbance distance is applied, only one or two greenshank territories, representing 0.3% of the number within the Caithness and Sutherland Peatland SPA, would potentially be within this displacement range.

9.6 Revised Impacts on Greenshank

The impacts of the T39 Layout on greenshank are presented, as with the 2013 ES Addendum, as a summary of information to inform the Appropriate Assessment. This can be found in Table 9.4. Where changes have been made to the assessment presented in Table A11.12 of the 2013 ES Addendum, these are highlighted in yellow.

9.7 Cumulative Impact Assessment

A further Cumulative Impact Assessment for collision risk of red-throated diver and greenshank has been carried out, based on figures obtained from Cumulative Assessment Spreadsheet for Wind Farms B383447[23], which was provided by SNH to the Applicant in November 2014. Figures for wind farms other than Strathy South were obtained from this spreadsheet unless otherwise stated. Although acknowledged by SNH that some of these figures may not represent true collision risk, no further information has been provided. The information contained in the spreadsheet has therefore been used as it is the best available at the time of writing.

9.7.1 Red-throated Diver

A cumulative assessment for red-throated diver collision risk for Betty Hill, Strathy South, Strathy North and Strathy Wood is presented in Table 9.1. A wind farm was only presented in the table if the spreadsheet provided by SNH showed the development to pose a collision risk greater than zero to this species. Of a total of twenty eight wind farms, four have been calculated to have a risk greater than zero.

TABLE 9.1 – CUMULATIVE CRM ASSESSMENT FOR RED-THROATED DIVER

Wind Farm	Collisions per year[23]	Collisions, 98% avoidance, over wind farm lifetime (assumed 25 years)[23]	% of Mainland Scotland Population (227 pairs)[16]	% of Caithness and Sutherland Peatlands breeding SPA Population (92 pairs)[16]	% if Caithness and Sutherland Peatlands SPA Total Number of Adults (189 birds)[16]
Betty Hill	0.06	1.5	0.33%	0.82%	0.79%
Strathy South	0.14	3.5	0.77%	1.90%	1.85%
Strathy North	0.07	1.75	0.38%	0.95%	0.93%
Strathy Wood	0.247	6.175	1.36%	3.36%	3.31%
Total	0.52	13	2.84%	7.07%	6.88%

The total cumulative collisions for the four wind farms is estimated to be 13 over the lifetime of these wind farms. This represents 2.84% of the total breeding red-throated diver population for mainland Scotland, 7.07% of the breeding diver population for the Caithness and Sutherland Peatlands SPA, and 6.88% of the total number of adults in the SPA. Almost half of these collisions are attributable to figures submitted in support of the proposed Strathy Wood wind farm, but to which SNH has not agreed acceptance. Based on the fact that CRM is generally precautionary, this is not considered to represent a significant cumulative impact overall.

9.7.2 Greenshank

A cumulative assessment for greenshank collision risk for Strathy South, Strathy North and Strathy Wood is presented in Table 9.2. A wind farm was only presented in the table if the spreadsheet provided by SNH showed the development to pose a collision risk greater than zero to this species. Of a total of twenty five wind farms, three have been calculated to have a risk greater than zero. One of those developments, Strathy Wood, does not have figures available at the time of writing. The figure for Strathy North of 0.01 collisions per year is the same as the revised figure for the T39 Layout.

[23] SNH (2014). B383447 – Cumulative Assessment Spreadsheet for Wind Farms.

TABLE 9.2 – CUMULATIVE CRM ASSESSMENT FOR GREENSHANK			
Wind Farm	**Collisions per year[23]**	**Collisions over wind farm lifetime (assumed 25 years)[23]**	**% of SPA Population (653 pairs[18])** Error! Bookmark not defined.
Strathy South	0.06	1.50	0.114%
Strathy North	0.01	0.25	0.019%
Strathy Wood	Insufficient survey data*	N/A	N/A
Total	0.02	0.5	0.038%

Notes:
* - No collision risk (i.e. zero) reported in Strathy Wood ES

The total cumulative collisions for the three wind farms is estimated to be 0.5 over the lifetime of these wind farms. This represents 0.038% of the total breeding greenshank population for the Caithness and Sutherland Peatlands SPA. Assuming that the Strathy Wood development would yield a collision risk similar to the other wind farms included in the assessment, this would increase the number of collisions to 0.047% of the SPA population.

Section 7.11.3 details that following work to adjust CRM for possible distance detection effects during VP surveys, a figure of 0.06 collisions per year was proposed for the T39 Layout. If this figure was applied to all three developments, this would result in a total (across all wind farms) of 4.5 collisions over the lifetime of the wind farms. This represents 0.34% of the SPA population.

Based on the fact that CRM is generally precautionary, and the fact that the greenshank population has increased substantially between 1994/5[21] and 2009[18]**Error! Bookmark not defined.**, and the current condition of the greenshank population as an SPA feature is 'Favourable Maintained', this is not considered to represent a significant cumulative impact overall.

Table 9.3 – Summary of Information to Inform the Appropriate Assessment: Red-throated Diver[24]						
Conservation Objective	**Project Phase**	**Findings in Relation to this Conservation Objective for the Project Alone and In Combination**	**Impact Before Mitigation**	**Mitigation**	**Impact After Mitigation**	**Degree of Certainty**
1. To avoid deterioration of the habitats of the qualifying species	Construction	No deterioration of diver habitat within the SPA.	None	None	None	High
	Operation	No deterioration of diver habitat within the SPA	None	None	None	High
	Decommission	No deterioration of diver habitat within the SPA	None	None	None	High
2. To avoid significant disturbance to the qualifying species	Construction	There is a risk of disturbance to breeding divers on Loch ID 44 complex (Loch nan Caorach) from access track widening, forest and construction traffic in and out of Strathy South. There is also the potential risk of disturbance from construction of the closest turbines (T1, T2) although both are >1km from the Loch. This loch complex is the most consistently used red-throated diver breeding site within 1km of Strathy South. It is important therefore to ensure disturbance is prevented. Other locations where there is a slight disturbance risk to breeding divers are Loch nan Clach (Loch ID 54), from track widening and turbine construction for T62 and T68 (although (a) breeding has not been confirmed at this site, and (b) there is screening from the existing forest). Loch ID 66 (the loch adjacent to the track crossing Yellow Bog), has also been used by the divers but no breeding has been recorded at this location. Loch ID 64 was the location of a breeding attempt in 2012, but this is the only year in which such activity has been recorded. It is	Risk of disturbance at one consistently used breeding location, plus some risk at less-frequently used lochans.	The construction of the bridge across Strathy River, from Strathy North, and the link track from the bridge to the Strathy Wood track, would be needed early on during construction, to enable forestry machinery onto Strathy South. Widening of the existing Strathy Wood track from there to Strathy South would not be required until larger plant needed site access. Therefore, for the majority of the construction period, until such point as the track needs to be widened for larger construction vehicles, the predicted traffic along the Strathy Wood track passing Loch ID 44 (Loch nan Caorach) would be relatively limited, limited to initial one-off mobilisation of forestry machinery, caravans, fuel storage plant etc. to enable tree removal. After this, plant will remain on site until all the work is completed, returning eventually (after 18 months/two years) back past the lochans. In between, traffic would comprise daily movement (primarily in the morning and early evening) of 4x4 vehicles and vans travelling on and off-site. After the initial forestry works to open up the footprint for wind farm infrastructure, site investigation plant would need access, but	None	High

[24] Where changes have been made to the assessment presented in Table A11.12 of the 2013 ES Addendum, these are highlighted in yellow.

Table 9.3 – Summary of Information to Inform the Appropriate Assessment: Red-throated Diver[24]						
Conservation Objective	**Project Phase**	**Findings in Relation to this Conservation Objective for the Project Alone and In Combination**	**Impact Before Mitigation**	**Mitigation**	**Impact After Mitigation**	**Degree of Certainty**
		located in excess of 500 m from the nearest turbine.		again the volume of traffic will be relatively limited, and comprise mainly 4x4 trucks plus drilling rig/s. The landform and fact that the track along this section is mainly in a cutting, means that standard 4x4 vehicles are likely to be screened from the diver lochs. The risk of visual disturbance therefore only arises from larger vehicles. The degree to which these can be seen will be confirmed by detailed line-of-sight surveys (completed outside of the breeding season) and if additional screening is required, this will be put in place before the bird breeding season so that these larger vehicles, as well as routine daily vehicle movements would be screened while birds are present. In addition to this mitigation, a Breeding Bird Protection Plan will impose strict traffic control measures throughout the divers' breeding season (i.e. no stopping, no engine revving or blasting of horns, no flashing lights, no personnel to get out of vehicles) over this 1km stretch. There will also be a strict site induction requirement for all staff coming on to site, to communicate the need to adhere to the above traffic control measures during the breeding season. This will be reinforced by road-side signage over this period. These traffic control measures will remain in place throughout all April to August months (inclusive) for the construction period. When it comes to the phase that requires track construction and widening, along 500 m either side of this loch complex, such works would only be done outside the diver breeding season, unless intensive monitoring confirms the lochs are not being used at all over the breeding period. Realistically, given the consistent occupancy of these lochs each		

Table 9.3 – Summary of Information to Inform the Appropriate Assessment: Red-throated Diver[24]						
Conservation Objective	**Project Phase**	**Findings in Relation to this Conservation Objective for the Project Alone and In Combination**	**Impact Before Mitigation**	**Mitigation**	**Impact After Mitigation**	**Degree of Certainty**
				survey year, the likelihood is that track widening will have to take place between mid/late August to early/mid April to avoid risk of disturbance to breeding divers. In either case, (monitor and deploy in the breeding season, or deploy in the non-breeding season) this mitigation would ensure disturbance is avoided. As part of the above measures, the ECoW will orchestrate a watching brief to ensure there is no disturbance to divers during construction of turbines T1 and T2 (in the event that these are constructed during the April to August breeding season). This will comprise an experienced ornithologist, in radio contact with the turbine crew, maintaining a watch over divers on the loch, to ensure there is no disturbance. Also, apart from the forest clearance to accommodate site investigation for T1, the Bad Coille forest sub-compartments 8f, 8a, 1c and 1a (Yield Classes 12, 6, 6, 8 respectively) will be retained until the end of construction, to provide partial screening during erection of turbines T1 and T2. The removal of these forest compartments will be completed outside the April to August period to avoid any risk of disturbance from forestry works. This combination of mitigation measures through the relevant phases of construction will ensure there is no disturbance to breeding divers on passed on the Loch nan Caorach complex (Loch ID 44). To help prevent disturbance to any divers on Loch nan Clach (Loch ID 54), an un-felled 20 m buffer would be retained at Forest sub-compartment Coille an Reidhe 2b (Yield Class 6) and Coille nan Clach sub-compartments 1a, 1b, 1c and 1d (Yield		

Table 9.3 – Summary of Information to Inform the Appropriate Assessment: Red-throated Diver[24]						
Conservation Objective	**Project Phase**	**Findings in Relation to this Conservation Objective for the Project Alone and In Combination**	**Impact Before Mitigation**	**Mitigation**	**Impact After Mitigation**	**Degree of Certainty**
				Classes 6, 6, 4 and 6 respectively) for the duration of construction, adjacent to the track. For Loch ID 66 (the loch adjacent to the track crossing Yellow Bog), the same traffic management as above will be used. A similar strategy will be employed at Loch 64 with regards to traffic along nearby tracks. In addition, a watching brief by the ECoW, as for turbines 1 and 2, will be applied to turbines 56, 61 and 70, which fall between 570-640 m of Loch 64.		
	Operation	A low risk that maintenance traffic causes disturbance to the breeding divers at the above locations.	Low risk of disturbance and breeding failure at any location.	A strict site induction requirement for all staff coming on to site, which will include briefing on need to adhere to the above traffic control measures during the breeding season. Supplemented by road-side signage. Any non-emergency road maintenance of the 1km stretch adjacent to Loch ID 44 (Loch nan Caorach) will be scheduled outside the April to August breeding season. SNH would be notified if any emergency works were required to the track or cables along this section, and a suitable protocol put in place immediately to minimise the risk of any disturbance	None	High
	Decommission	As for construction, except the extent of disturbance would be reduced, as there would be no widening of tracks required.	Intermediate risk of disturbance and breeding failure.	As for construction.	None	High
3. Population of the species as a viable component of the site is	Construction	None, as the risk of disturbance and nest failure will be prevented through the disturbance-prevention measures for the Conservation Objective above. Consequently, there will be no risk to the viability of the SPA population from construction.	None	None	None	High

Table 9.3 – Summary of Information to Inform the Appropriate Assessment: Red-throated Diver[24]						
Conservation Objective	**Project Phase**	**Findings in Relation to this Conservation Objective for the Project Alone and In Combination**	**Impact Before Mitigation**	**Mitigation**	**Impact After Mitigation**	**Degree of Certainty**
maintained in the long term	Operation	Collision risk modelling, based on a precautionary 98% avoidance rate, and incorporating a 200m buffer around the risk area, gives a predicted average collision rate of approximately one bird every seven years (0.14 collisions a year). This mean is derived from annual rates of predicted collision from 0.00 to 0.46 collisions a year (2007 = 0.08, 2010 = 0, 2012 = 0.46, 2014 = 0). Collision risk in 2003 and 2004 was zero. Over 25 years, this represents 3-4 collisions. Based on the most recent SPA population estimate of breeding divers (46 pairs; 2006), 3.70% of this population may be lost to collision. However, this figure is considered to be precautionary as avoidance, which has been observed strongly elsewhere, is not accounted for, nor has the non-breeding population. The highest predicted collision rate was in 2012, when there was increased red-throated diver activity around Loch ID 64, the only survey year in six during which substantial flight activity was observed around this loch. The SNH assessed condition of this qualifying feature is favourable maintained (2006).	The addition of an average of 1 diver collision every seven years (compared to five for the Modified 2013 Scheme) is not judged significant addition to existing levels of background mortality, and would not threaten the viability of the SPA population being maintained in the long term.	In recognition of the need to minimise collision risk where possible, a dual approach to mitigation is proposed. The first is to reduce the level of risk itself, by diverting breeding from Loch ID 64 (which is outside the SPA). This would be achieved by methods such as using moored ropes, floats and coloured buoys across this small water body, or other as agreed in consultation with SNH. By diverting the occasional use of this non-SPA lochan for breeding (recorded one year out of six surveyed), the chance of 'at risk' flight activity is reduced and the collision risk would also be reduced. The accompanying positive mitigation measure that would be used, if required by SNH, and in consultation with them, is the sustained provision of diver rafts aimed at increasing breeding success and productivity of red (and black) throated divers. A variety of locations are being considered for these rafts, at sufficient distance from the wind farm to avoid any additional risk. If considered necessary for mitigation, it is proposed to provide funding and staff resources to construct, deploy, maintain and monitor between diver rafts, depending on site availability and SNH requirements. By avoiding breeding at Loch ID 64, and assuming the diverted birds bred locally, leading to flight patterns in 2007 (the next highest predicted collision rate), the mean predicted collision rate would fall from 0.19 to 0.14, equivalent to going from 1 every 5.3 years to 1 every 7.1 years. This would mean a reduction from approximately 4.7 collisions over the lifetime of the wind farm, to approximately 3.5 birds. If the 98% avoidance	None	High

Table 9.3 – Summary of Information to Inform the Appropriate Assessment: Red-throated Diver[24]						
Conservation Objective	**Project Phase**	**Findings in Relation to this Conservation Objective for the Project Alone and In Combination**	**Impact Before Mitigation**	**Mitigation**	**Impact After Mitigation**	**Degree of Certainty**
				rate for red-throated divers proves to be over-precautionary, as emerging evidence would seem to suggest, then the frequency of collisions would be lower. The extent to which the provision of diver rafts would generate additional birds (i.e. the difference in the number of young fledged, compared to the number of young fledged without the diver rafts) would be considered in liaison with SNH. The aim would be to enable sufficient additional fledged birds, so that, allowing for natural mortality of these offspring, there would be sufficient birds entering the adult breeding population to mitigate. This is considered to be a realistic and achievable outcome. Elsewhere i.e. Carreag Gheal in Argyll, and Smola in Norway, divers have been shown to successfully breed in areas post construction and to avoid turbines. No casualties have been reported at either site.		
	Decommission	None, as the risk of disturbance and nest failure will be prevented. Consequently, there will be no risk of any effect on the viability of the SPA population.	None	None	None	High
4. Distribution of the species within site is maintained in the long term	Construction	None, as the risk of disturbance would be avoided through the measures described above.	None	None	None	High
	Operation	The consistent presence of successfully breeding red-throated divers in close proximity (within 300m) to the Burgar Hill Wind Farm, in Orkney, indicates the distribution of breeding red-throated divers will be maintained in the long term. Similar observations were recorded at Carraig Gheal wind farm, with breeding occurring successfully within 750m of turbines.	None	Provision of diver rafts aims to increase breeding opportunities (and success).Therefore in the long-term, this would support the distribution of this species within (and beyond) the SPA.	None	High

Table 9.3 – Summary of Information to Inform the Appropriate Assessment: Red-throated Diver[24]						
Conservation Objective	**Project Phase**	**Findings in Relation to this Conservation Objective for the Project Alone and In Combination**	**Impact Before Mitigation**	**Mitigation**	**Impact After Mitigation**	**Degree of Certainty**
	Decommission	None, as the risk of disturbance would be avoided through the measures described above.	None	None	None	High
5. Distribution and extent of habitats supporting the species is maintained in the long term	Construction	No effects on the distribution and extent of diver habitat within the SPA.	None	None.	None	High
	Operation	No effects on the distribution and extent of diver habitat within the SPA.	None	Provision of diver rafts aims to increase breeding opportunities (and success). Therefore in the long-term, this would support the distribution and extent of habitats supporting this species within (and beyond) the SPA.	None	High
	Decommission	No effects on the distribution and extent of diver habitat within the SPA.	None	None	None	High
6. Structure, function and supporting processes of habitats supporting the species is maintained in the long term	Construction	No effects on the structure, function and supporting processes of habitat supporting divers within the SPA.	None	None	None	High
	Operation	No effects on the structure, function and supporting processes of habitat supporting divers within the SPA.	None	None	None	High
	Decommission	No effects on the structure, function and supporting processes of habitat supporting divers within the SPA.	None	None	None	High
7. No significant disturbance of the species is maintained in the long term	Construction	This is already covered under the 2nd Conservation Objective, above.	See the 2nd Conservation Objective.	See the 2nd Conservation Objective	None	High
	Operation	This is already covered under the 2nd Conservation Objective, above.	See the 2nd Conservation Objective.	See the 2nd Conservation Objective	None	High
	Decommission	This is already covered under the 2nd Conservation Objective, above.	See the 2nd Conservation Objective.	See the 2nd Conservation Objective	None	High

Table 9.4 – Summary of Information to Inform the Appropriate Assessment: Greenshank[24]						
Conservation Objective	**Project Phase**	**Findings in Relation to this Conservation Objective for the Project Alone and In Combination**	**Impact Before Mitigation**	**Mitigation**	**Impact After Mitigation**	**Degree of Certainty**
1. To avoid deterioration of the habitats of the qualifying species	Construction	The T39 Layout would avoid deterioration of greenshank habitat within the SPA.	None	No mitigation is required because there is no impact on this conservation objective. However, there will be indirect localised benefits to peatland hydrology from the removal of approximately 32km of forest edge and accompanying blocking of active forest drains and any remaining historic but active hill grips. In addition, as part of peatland mitigation measures, there will be further targeted additional drain blocking on previously un-planted areas that will also benefit this species, by increasing localised water table levels and pools.	None	High
	Operation	The T39 Layout would avoid deterioration of greenshank habitat within the SPA.	None	None. The measures above will continue to provide evolving benefits, as the measures take effect.	None	High
	Decommission	The T39 Layout would avoid deterioration of greenshank habitat within the SPA.	None	None. The measures above will provide on-going benefits, as the measures continue take effect.	None	High
2. To avoid significant disturbance to the qualifying species	Construction	The use of a number of published methods has resulted in a maximum estimate of 31 pairs of greenshank in 2010 within 1 km of the red-line boundary, and 26 in 2012. The method used to carry out the national census in 1994 suggested that 11 and 10 breeding territories were present in 2010 and 2012. All but one of these registrations was recorded beyond the 200 m disturbance distance from the nearest turbine previously quoted by SNH during the PLI for the nearby Achany wind farm.	None	None. Pre-commencement breeding surveys, together with open ground checks by ornithologists and the implementation of the Breeding Bird Protection Plan would ensure there is no disturbance to breeding greenshank. Staff will also be given site inductions on the need to comply with wildlife legislation, and provided with training and reference material on this species, to help ensure any breeding activity is recognised and the appropriate actions put in place.	None	High
	Operation	The distribution of breeding greenshank will be monitored during Years 1, 2, 3, 5, 10 and 15 and will ensure information available to site	None	None. Breeding monitoring that would be carried out in Year 1, 2, 3, 5, 10 and 15 will help determine whether or not any breeding is taking place on site or within a 500 m	None	High

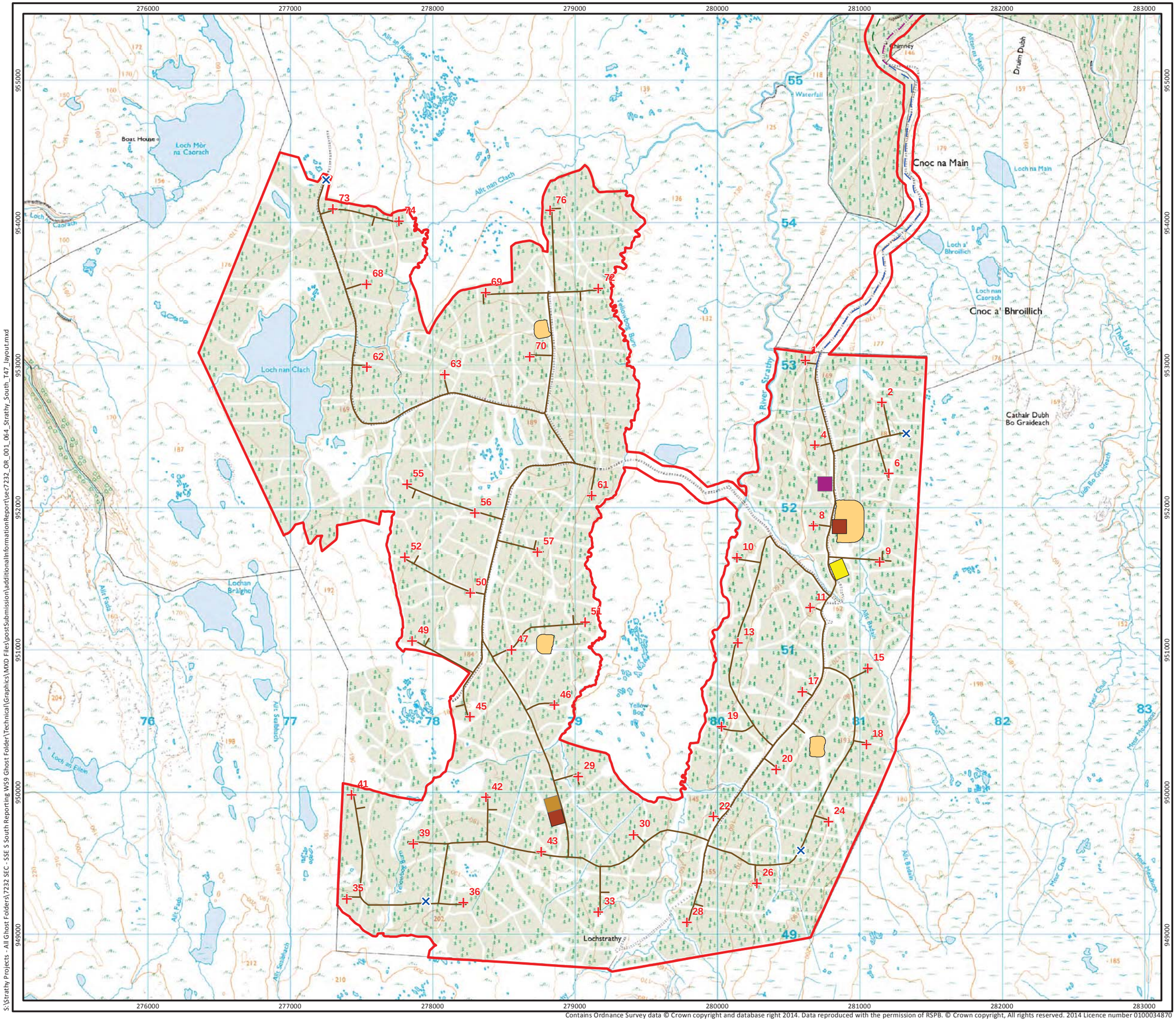
Table 9.4 – Summary of Information to Inform the Appropriate Assessment: Greenshank[24]						
Conservation Objective	**Project Phase**	**Findings in Relation to this Conservation Objective for the Project Alone and In Combination**	**Impact Before Mitigation**	**Mitigation**	**Impact After Mitigation**	**Degree of Certainty**
		staff on the breeding distribution of this species over the early years of its operation. The location of activity has been relatively consistent, which helps ensure any potentially disturbing activities can be planned with this information in mind.		buffer. If breeding is confirmed, then an appropriate protocol would be put in place to avoid any disturbance. Staff will also be given an annual briefing on the need to comply with wildlife legislation, and provided with training and reference material on this species, to help ensure any breeding activity is recognised and the appropriate actions put in place.		
	Decommission	The occurrence of breeding greenshank will be monitored prior to any decommissioning.	None	None. Pre-decommissioning breeding surveys by ornithologists and the implementation of the Breeding Bird Protection Plan would ensure there is no disturbance to breeding greenshank.	None	High
3. Population of the species as a viable component of the site is maintained in the long term	Construction	The use of a number of published methods has resulted in a maximum estimate of 31 pairs of greenshank in 2010 within 1 km of the red-line boundary, and 26 in 2012. The method used to carry out the national census in 1994 suggested that 11 and 10 breeding territories were present in 2010 and 2012. All but one of these registrations was recorded beyond the 200 m disturbance distance from the nearest turbine previously quoted by SNH during the PLI for the nearby Achany wind farm.	There is a risk of inadvertent harm to nests or chicks from trampling or by machinery.	The same measures used as mitigation for the 2nd Conservation Objective above will also apply here.	None	High
	Operation	There was low 'at risk' flight activity recorded across the site. Taking account of potential under-recording of flight activity, predicted collision rates are still negligible, representing a total of 1-2 collisions over the lifetime of the wind farm. In addition, removal of the forest plantation is predicted to reduce average flight height and therefore further reduce the predicted collision rate. Therefore, if greenshank were not displaced from the site, the risk of collision from these findings, would be negligible, and would	None, as it is assumed that if the highly precautionary predicted 7 territories were displaced, the SPA has the carrying capacity to	Whilst no mitigation is judged to be necessary, it is noteworthy that elements of the T39 Layout and its associated mitigation for peatland impacts will benefit this species on the adjacent SPA. Primarily, the removal of the conifer plantation itself will potentially reduce mammalian predation, and increase connectivity between foraging areas. There will also be localised benefits on and adjacent to the site from improvements to peatland hydrology resulting from the removal of approximately 32km of forest edge and the	None	High

Table 9.4 – Summary of Information to Inform the Appropriate Assessment: Greenshank[24]						
Conservation Objective	**Project Phase**	**Findings in Relation to this Conservation Objective for the Project Alone and In Combination**	**Impact Before Mitigation**	**Mitigation**	**Impact After Mitigation**	**Degree of Certainty**
		certainly not have any effect on the SPA population, which is currently estimated to be 653 pairs. In their 2nd October 2007 response, SNH proposed in relation to territory displacement that all greenshank territories within 200 m of turbines should be considered lost to the population. It is considered that there is insufficient evidence to safely conclude there will be no displacement beyond 200 m (although this is possible). It is considered certain that there is sufficient carrying capacity within the SPA to absorb any birds displaced, if displacement did occur. The SNH assessed condition of this qualifying feature is favourable maintained (2009).	support these birds.	accompanying blocking of active forest drains and any remaining historic but active hill grips along this SPA/SAC boundary, In addition, as part of peatland mitigation measures, there will be further targeted additional drain blocking on 23.5 ha of previously un-planted areas that will also benefit this species, by increasing localised water table levels and pools, as well as additional offsite enhancement. On the basis of its breeding requirements, it is reasonable to infer that these habitat improvement measures will have some benefit to the quality and extent of breeding habitat for this species, and although it would be difficult to predict and quantify at this stage, there is potential that it will counter-balance any potential displacement pressure from the presence of the turbines.		
	Decommission	None, as there is no risk of disturbance.	None	None	None	High
4. Distribution of the species within site is maintained in the long term	Construction	There will not be any impact on the distribution of the species within the site in the long term, as disturbance will be avoided in order to comply with wildlife legislation.	None	None	None	High
	Operation	The survey results from 2003 to 2012 show that no nesting greenshank would be displaced. However, there is relatively limited information on greenshank breeding in proximity to operational turbines. A very limited number of territories could be displaced. It is considered that there is sufficient carrying capacity within the SPA to absorb these birds, if displacement did occur.	Very limited displacement of greenshank territories	Whilst no mitigation is judged to be necessary, the measures for the 3rd Conservation Objective above would benefit this species.	None	High

Table 9.4 – Summary of Information to Inform the Appropriate Assessment: Greenshank[24]						
Conservation Objective	**Project Phase**	**Findings in Relation to this Conservation Objective for the Project Alone and In Combination**	**Impact Before Mitigation**	**Mitigation**	**Impact After Mitigation**	**Degree of Certainty**
	Decommission	If displacement had taken place, decommissioning would result in re-establishment of territories in the long term.	None	None	None	High
5. Distribution and extent of habitats supporting the species is maintained in the long term	Construction	No effects on the distribution and extent of habitat within the SPA.	None	None.	None	High
	Operation	No effects on the distribution and extent of habitat within the SPA.	None	None. Note the potential beneficial impact that would result for habitat extent, described under the 3rd Conservation Objective above.	None	High
	Decommission	No effects on the distribution and extent of habitat within the SPA.	None	None	None	High
6. Structure, function and supporting processes of habitats supporting the species is maintained in the long term	Construction	Removal of the plantation accompanied by blocking of active forest drains and any active historical hill grips would enhance peatland hydrology along approximately 32km of the SPA boundary.	None	None. Note the potential beneficial impact that would result for habitat extent, described under the 3rd Conservation Objective above.	None	High
	Operation	Removal of the plantation accompanied by blocking of active forest drains and any active historical hill grips would enhance peatland hydrology along approximately 32km of the SPA boundary.	None	None. Note the potential beneficial impact that would result for habitat extent, described under the 3rd Conservation Objective above.	None	High
	Decommission	No effects on the structure, function and supporting processes of habitat supporting greenshank within the SPA.	None	None	None	High
7. No significant disturbance of the species is maintained in the long term	Construction	Covered under the 2nd Conservation Objective, above.	None	See the 2nd Conservation Objective	None	High
	Operation	Covered under the 2nd Conservation Objective, above.	None	See the 2nd Conservation Objective	None	High
	Decommission	Covered under the 2nd Conservation Objective, above.	None.	See the 2nd Conservation Objective	None	High

FIGURES

List of Figures



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sse

RPS

Key

- Turbine
- Permanent Met Mast
- Site Boundary
- Tracks
- Preferred Access Route
- Alternative Access Route
- Common Access Route
- Concrete Batching Plant
- Construction Compound
- Laydown Area
- Switching Station
- Borrow Pit

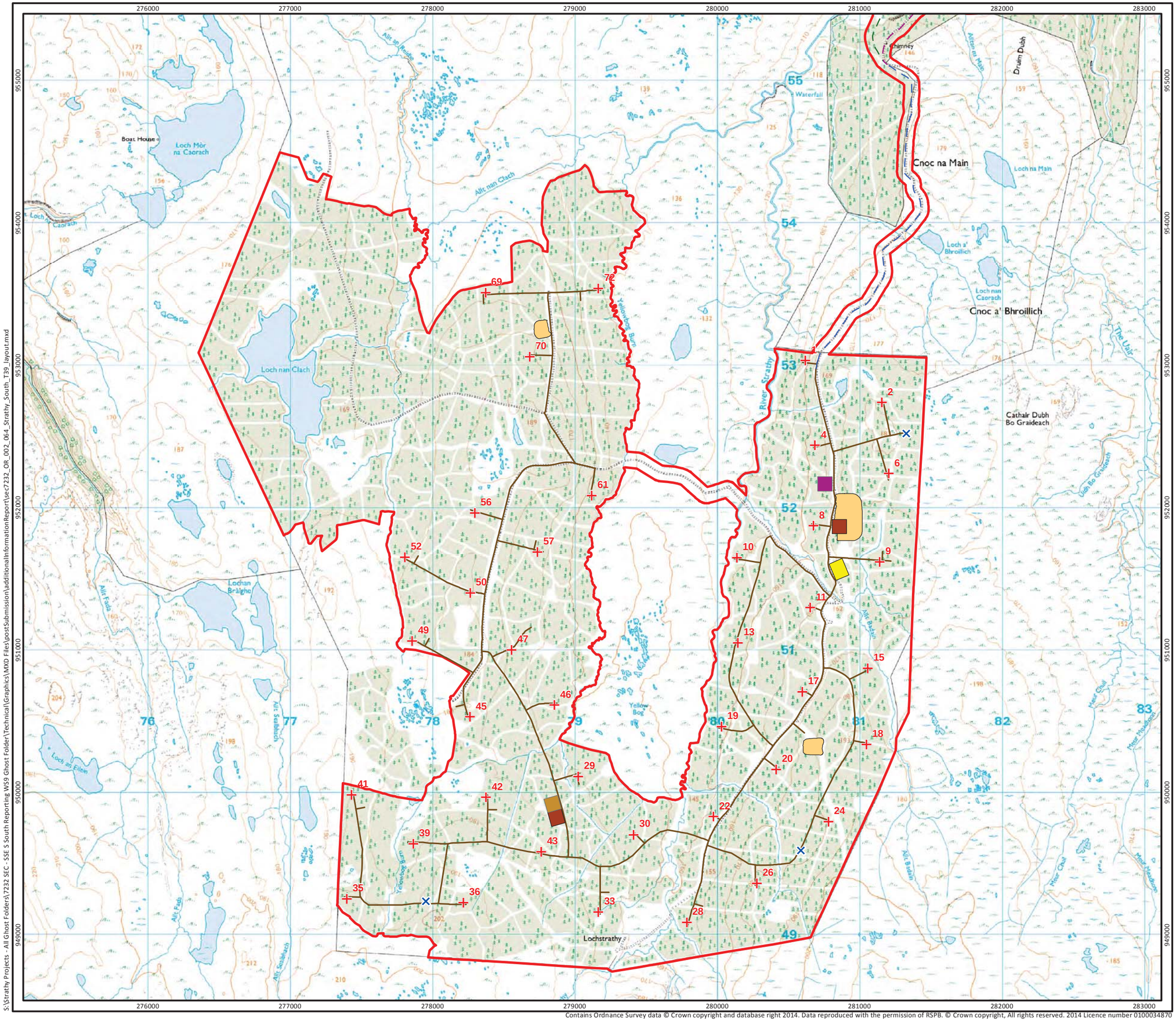
N

Scale 1:25,000 @ A3

0 0.25 0.5 1 km

Figure 1
Strathy South T47 layout and associated infrastructure

Strathy South Wind Farm
Ornithological Additional Information Report



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sse

RPS

Key

- Turbine
- Permanent Met Mast
- Site Boundary
- Tracks
- Preferred Access Route
- Alternative Access Route
- Common Access Route
- Concrete Batching Plant
- Construction Compound
- Laydown Area
- Switching Station
- Borrow Pit

N

Scale 1:25,000 @ A3

0 0.25 0.5 1 km

Figure 2
Strathy South T39 layout and associated infrastructure

Strathy South Wind Farm
Ornithological Additional Information Report

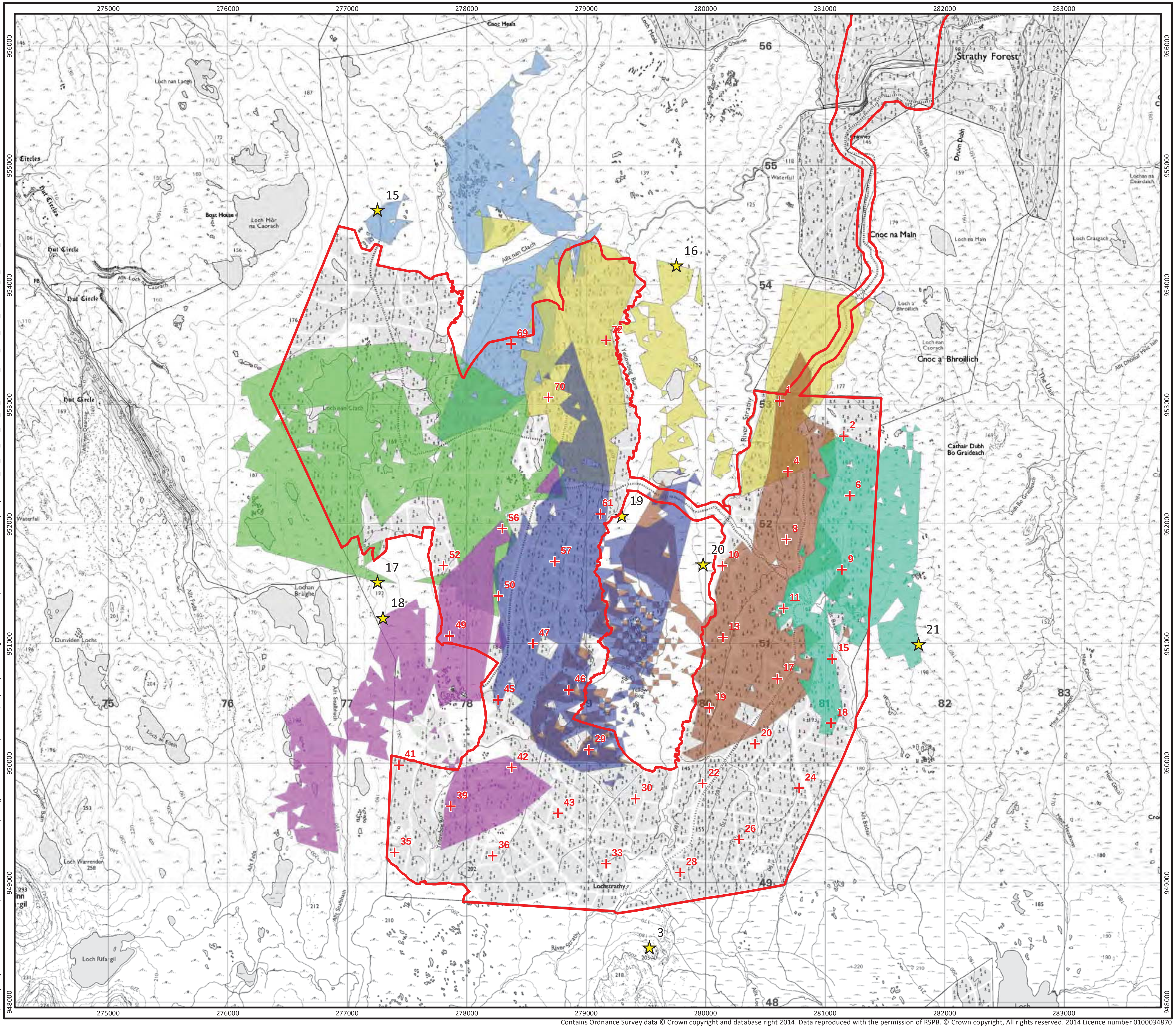

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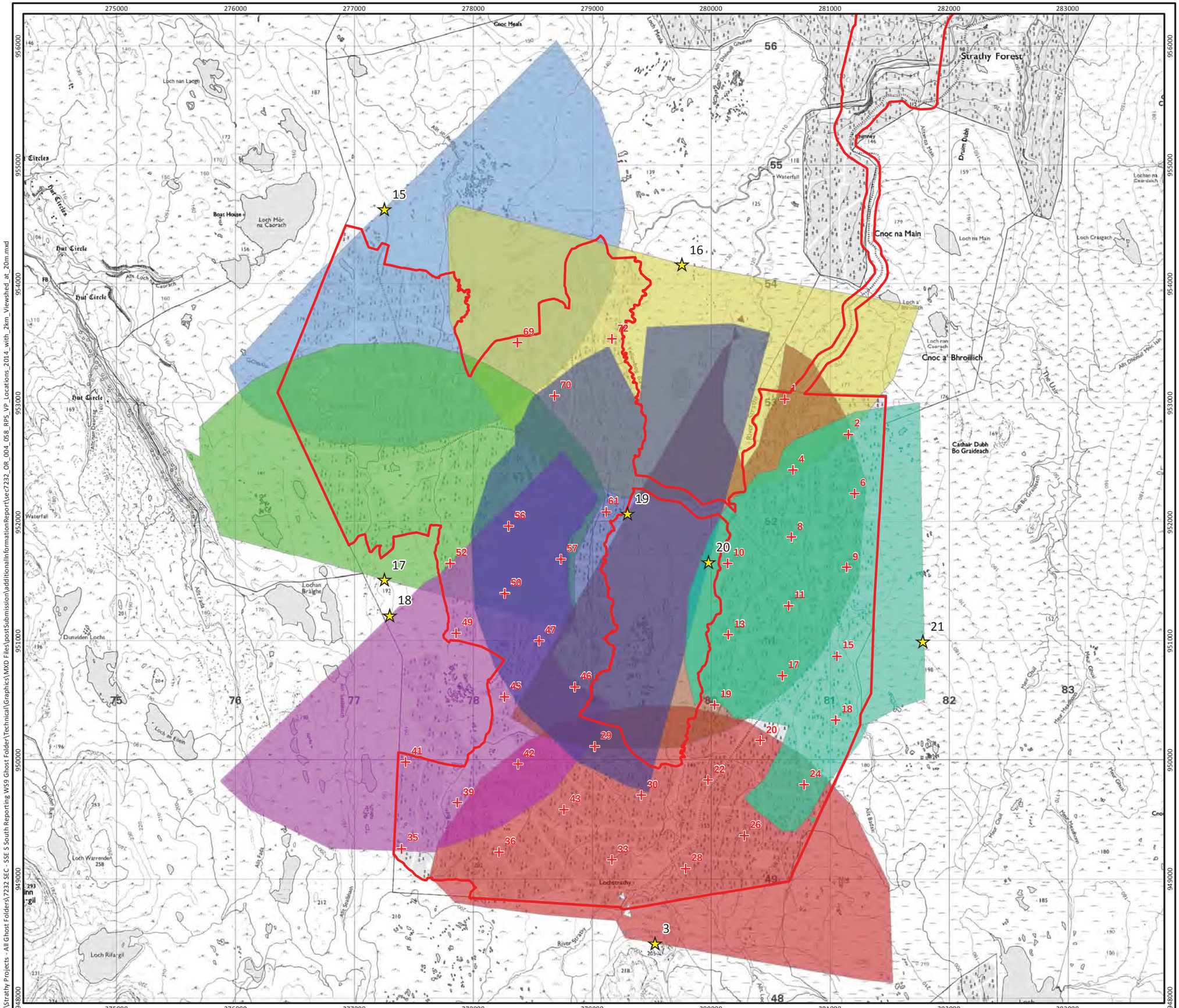
Figure 3
VP Locations and viewsheds (0 m) for 2014

Strathy South Wind Farm Ornithological Additional Information Report



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sse

RPS

Key

- Turbine
- Site Boundary
- RPS VP Locations
- VP 3 Viewshed
- VP 15 Viewshed
- VP 16 Viewshed
- VP 17 Viewshed
- VP 18 Viewshed
- VP 19 Viewshed
- VP 20 Viewshed
- VP 21 Viewshed

N

Scale 1:30,000 @ A3

0 0.25 0.5 1 km

Figure 4
VP Locations and viewsheds (20 m) for 2014

Strathy South Wind Farm Ornithological Additional Information Report

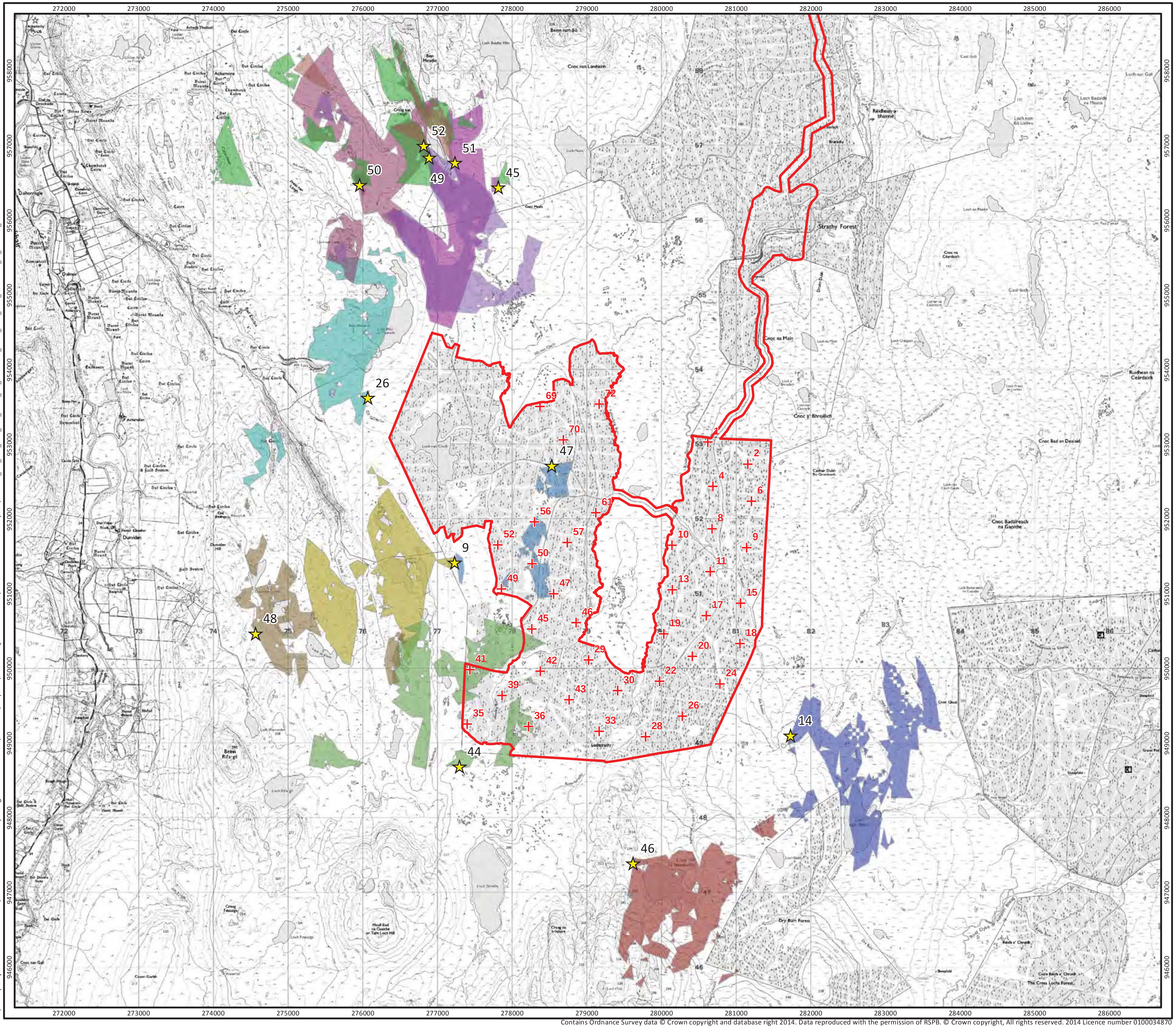

Figure 5
Diver VP locations and viewsheds (0 m) for 2014

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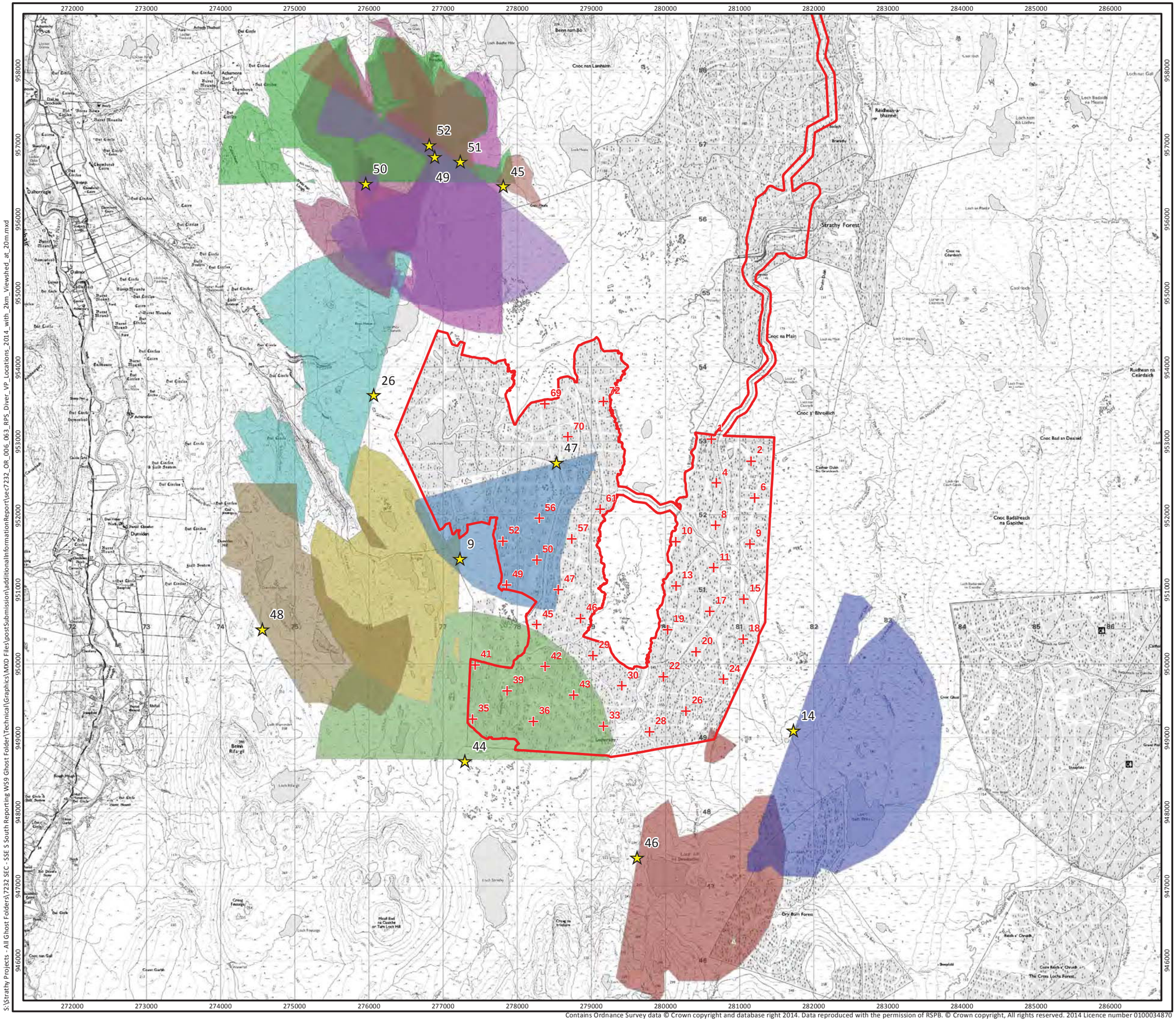

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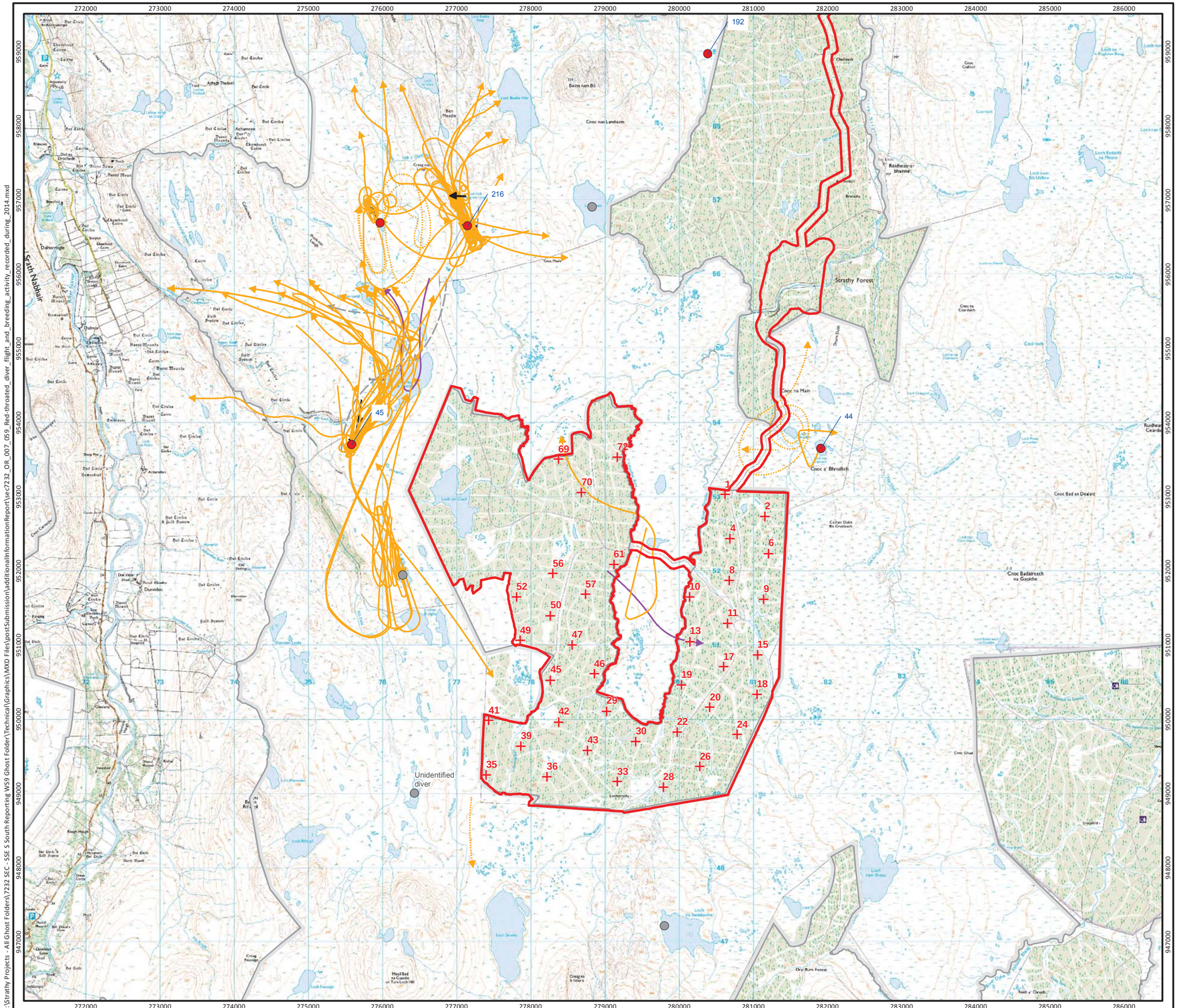
Figure 6
Diver VP locations and viewsheds (20 m) for 2014

Strathy South Wind Farm
Ornithological Additional Information Report



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Key

- Turbine
- Site Boundary

Breeding Status

- Confirmed
- Non-breeding

Flights (see note)

- Height A
- Height B
- Height C
- Non-VP flights
- Caithness and Sutherland Peatlands SAC and SPA

Notes:
Unidentified diver flights are displayed with dotted lines.

Loch ID is displayed in blue text for sites with confirmed or possible breeding (except for a breeding observation to the NW of the site which is outside of the formal survey area).

Standard and Diver VP flights are displayed in three height bands which approximate to below rotor height (A), at rotor height (B) and above rotor height (C). If any portion of the flight was recorded at approximate rotor height it is assigned to band B. Rotor height is 31 - 135 m. These height bands are used for mapping purposes only.

The 2014 surveys covered at least a 2 km buffer around the red line boundary, with the exception of the area to the northeast of the red line boundary, which is the subject of a data sharing agreement between the Applicant, the landowner and EON, developers of the Strathy Wood wind farm, which was set up to minimise disturbance to Schedule 1 species. All lochs, lochans and pool systems within the identified buffer outwith the data sharing zone were surveyed for red-throated diver.

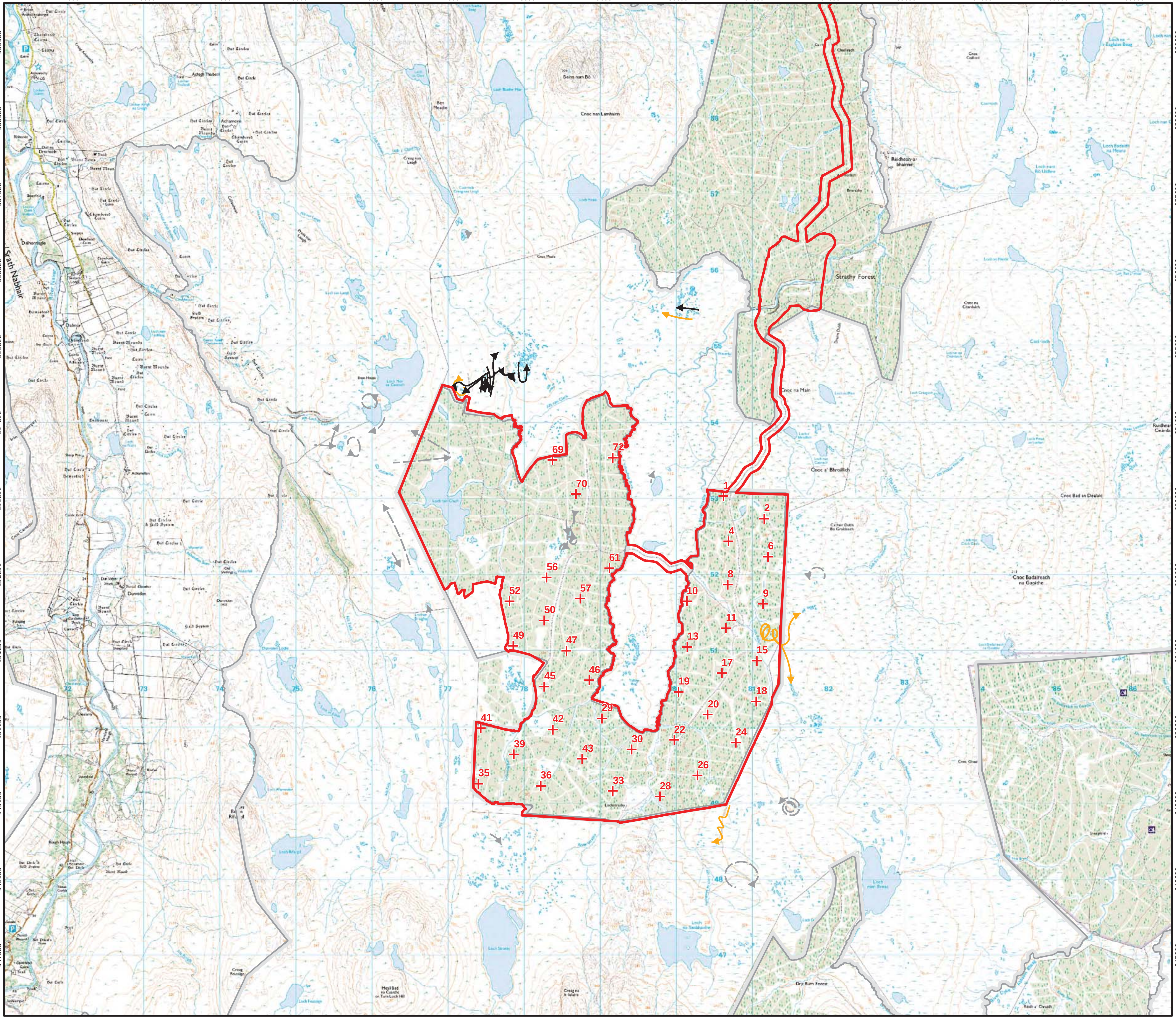
N

Scale 1:48,000 @ A3

0 0.25 0.5 1 km

Figure 7
Red-throated diver flight and breeding activity recorded during 2014 surveys

Strathy South Wind Farm
Ornithological Additional Information Report



Key

Turbine

Site Boundary

Flights (see note)

Height A

Height B

Height C

Non-VP flights

Caithness and Sutherland Peatlands SAC and SPA

Notes:
Standard VP flights are displayed in three height bands which approximate to below rotor height (A), at rotor height (B) and above rotor height (C). If any portion of the flight was recorded at approximate rotor height it is assigned to band B. Rotor height is 31 - 135 m. These height bands are used for mapping purposes only.

Scale 1:48,000 @ A3

0 0.25 0.5 1 km

Figure 8
Greenshank flight activity recorded during 2014 surveys

Strathy South Wind Farm Ornithological Additional Information Report

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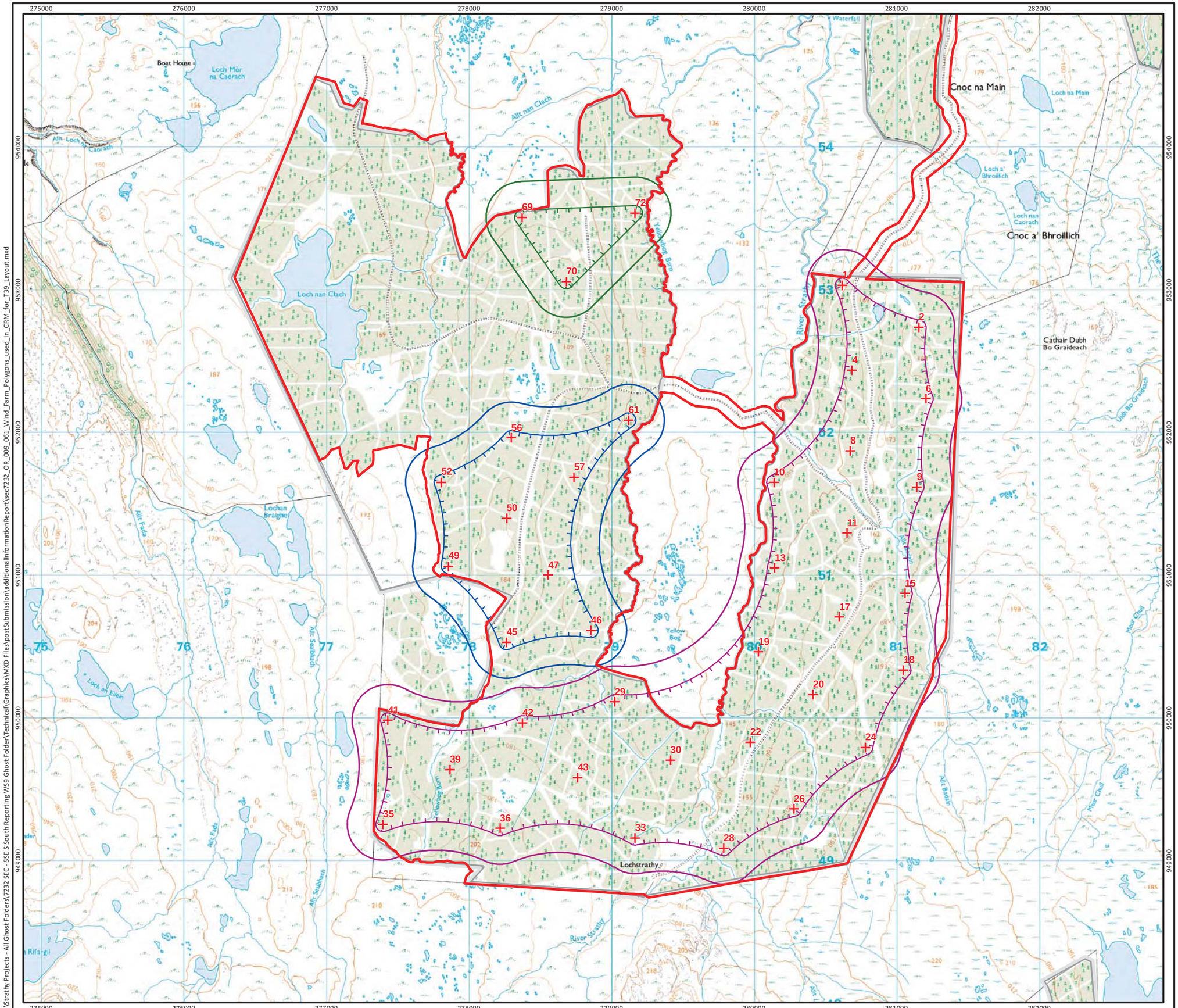

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Key

- Turbine
- Site Boundary

200 m wind farm polygon buffer

- Wind farm polygon 1
- Wind farm polygon 2
- Wind farm polygon 3

Wind Farm Polygon

- Polygon 1
- Polygon 2
- Polygon 3
- Caithness and Sutherland Peatlands SAC and SPA

Wind farm polygons were defined algorithmically; see text for details.

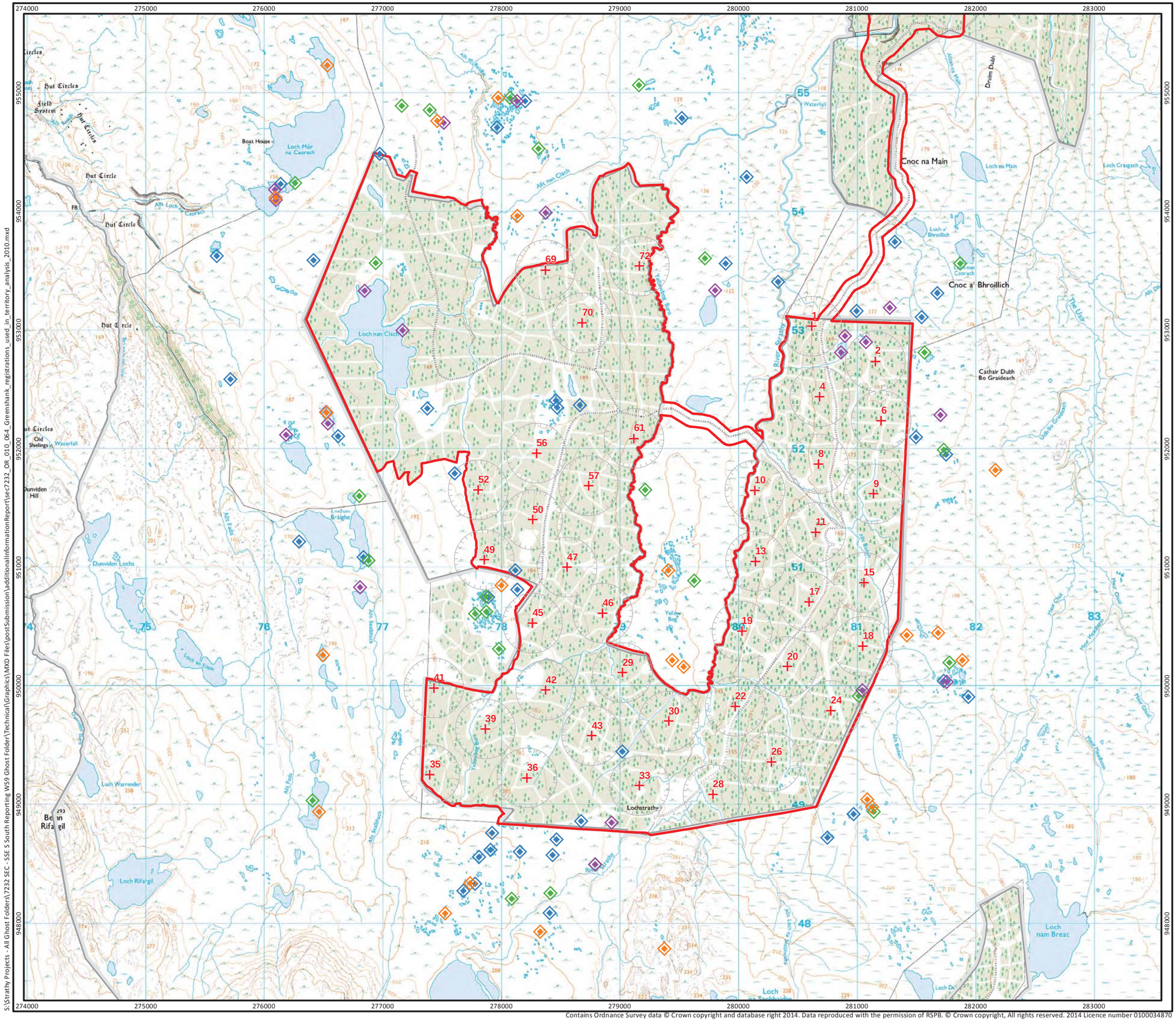
N

Scale 1:25,000 @ A3

0 0.25 0.5 1 km

Figure 9
Wind Farm Polygons used in CRM for T39 Layout

Strathy South Wind Farm Ornithological Additional Information Report



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sse

RPS

Key

- Turbine
- Site Boundary
- Visit 1
- Visit 2
- Visit 3
- Visit 4
- SNH-proposed greenshank disturbance distance (200 m from blade tip)
- Caithness and Sutherland Peatlands SAC and SPA

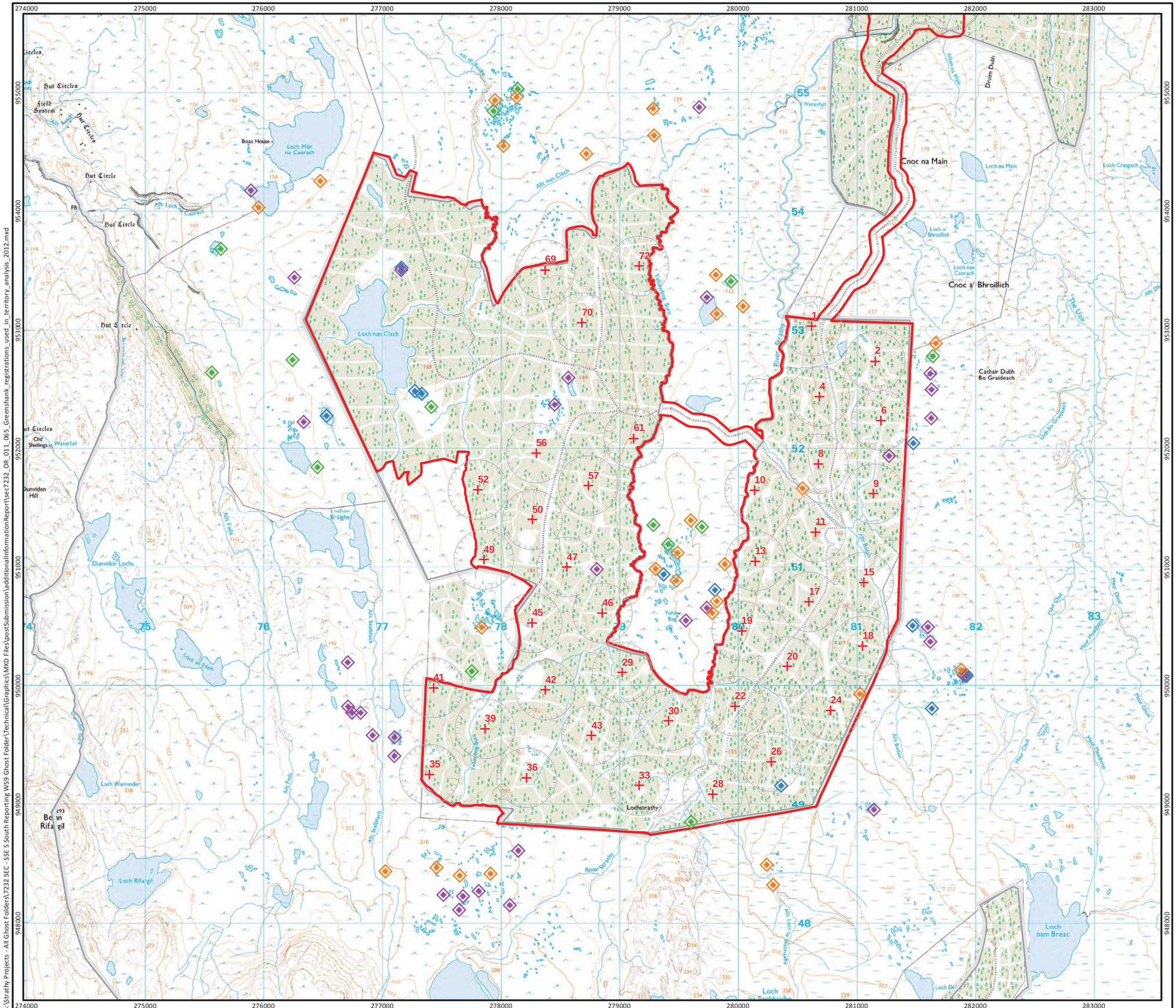
N

Scale 1:30,000 @ A3

0 0.25 0.5 1 km

Figure 10
Greenshank registrations used in territory analysis, 2010

Strathy South Wind Farm
Ornithological Additional Information Report



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sse

RPS

Key

- Turbine
- Site Boundary
- Visit 1
- Visit 2
- Visit 3
- Visit 4
- Caithness and Sutherland Peatlands SAC and SPA
- SNH-proposed greenshank disturbance distance (200 m from blade tip)

N

Scale 1:30,000 @ A3

0 0.25 0.5 1 km

Figure 11
Greenshank registrations used in territory analysis, 2012

Strathy South Wind Farm Ornithological Additional Information Report

APPENDIX 1 – DETAILS OF FLIGHT ACTIVITY SURVEYS 2014

Year	Date	Month	Vantage Point	Observer	Start Time	End Time	Duration	Sunrise	Sunset
2014	24/05/2014	5	16	PH	16:20	19:20	03:00	04:32	21:55
2014	24/05/2014	5	16	PH	19:55	22:55	03:00	04:32	21:55
2014	25/05/2014	5	15	PH	08:30	11:30	03:00	04:30	21:57
2014	25/05/2014	5	15	PH	16:30	19:30	03:00	04:30	21:57
2014	25/05/2014	5	15	PH	20:00	23:00	03:00	04:30	21:57
2014	27/05/2014	5	16	PH	08:25	11:25	03:00	04:27	22:00
2014	27/05/2014	5	18	PH	16:00	19:00	03:00	04:27	22:00
2014	27/05/2014	5	21	TJS	16:35	19:35	03:00	04:27	22:00
2014	28/05/2014	5	20	PH	08:15	11:15	03:00	04:25	22:02
2014	31/05/2014	5	3	TJS	13:50	16:50	03:00	04:21	22:07
2014	31/05/2014	5	3	TJS	20:30	23:00	02:30	04:21	22:07
2014	01/06/2014	6	3	TJS	03:55	06:55	03:00	04:20	22:09
2014	01/06/2014	6	17	TJS	20:00	23:00	03:00	04:20	22:09
2014	02/06/2014	6	3	TJS	19:15	21:15	02:00	04:18	22:10
2014	02/06/2014	6	3	TJS	21:45	23:05	01:20	04:18	22:10
2014	02/06/2014	6	18	TJS	04:30	07:30	03:00	04:18	22:10
2014	03/06/2014	6	3	TJS	10:20	13:30	03:10	04:17	22:12
2014	03/06/2014	6	17	TJS	15:15	18:15	03:00	04:17	22:12
2014	06/06/2014	6	3	TJS	15:50	18:50	03:00	04:14	22:16
2014	06/06/2014	6	18	TJS	19:45	22:45	03:00	04:14	22:16
2014	06/06/2014	6	21	TJS	12:00	15:00	03:00	04:14	22:16
2014	07/06/2014	6	18	TJS	19:25	22:25	03:00	04:13	22:17
2014	07/06/2014	6	20	TJS	14:30	17:30	03:00	04:13	22:17
2014	07/06/2014	6	21	TJS	10:35	13:35	03:00	04:13	22:17
2014	08/06/2014	6	3	TJS	04:40	07:40	03:00	04:12	22:18
2014	08/06/2014	6	3	WR	20:00	21:30	01:30	04:12	22:18
2014	08/06/2014	6	18	WR	09:45	12:45	03:00	04:12	22:18
2014	08/06/2014	6	21	TJS	09:15	12:15	03:00	04:12	22:18
2014	09/06/2014	6	15	TJS	04:05	07:05	03:00	04:11	22:19
2014	09/06/2014	6	16	TJS	08:40	11:40	03:00	04:11	22:19
2014	09/06/2014	6	19	TJS	19:10	22:10	03:00	04:11	22:19
2014	09/06/2014	6	20	WR	04:05	07:05	03:00	04:11	22:19
2014	09/06/2014	6	44	WR	18:50	21:50	03:00	04:11	22:19
2014	09/06/2014	6	44	WR	12:40	15:40	03:00	04:11	22:19
2014	10/06/2014	6	15	TJS	19:40	22:40	03:00	04:11	22:20
2014	10/06/2014	6	16	TJS	10:10	13:10	03:00	04:11	22:20
2014	10/06/2014	6	19	TJS	13:50	16:50	03:00	04:11	22:20
2014	10/06/2014	6	20	WR	19:30	22:30	03:00	04:11	22:20
2014	11/06/2014	6	16	WR	14:15	17:15	03:00	04:10	22:21
2014	11/06/2014	6	19	WR	10:15	13:15	03:00	04:10	22:21
2014	15/06/2014	6	15	WR	16:00	19:00	03:00	04:08	22:24
2014	15/06/2014	6	17	WR	20:00	22:30	02:30	04:08	22:24
2014	16/06/2014	6	20	WR	11:30	14:30	03:00	04:08	22:25
2014	17/06/2014	6	15	WR	09:20	12:20	03:00	04:08	22:26
2014	17/06/2014	6	17	WR	13:20	16:20	03:00	04:08	22:26
2014	25/06/2014	6	26	TJS	18:40	21:40	03:00	04:09	22:27
2014	26/06/2014	6	26	TJS	15:55	18:55	03:00	04:10	22:27
2014	26/06/2014	6	45	TJS	20:10	23:10	03:00	04:10	22:27
2014	26/06/2014	6	47	TJS	11:55	14:55	03:00	04:10	22:27
2014	27/06/2014	6	45	TJS	04:05	07:05	03:00	04:11	22:27
2014	27/06/2014	6	45	TJS	08:00	11:00	03:00	04:11	22:27
2014	27/06/2014	6	47	TJS	15:20	18:20	03:00	04:11	22:27
2014	29/06/2014	6	20	CR	11:10	14:10	03:00	04:12	22:26
2014	29/06/2014	6	26	TJS	15:15	18:15	03:00	04:12	22:26
2014	29/06/2014	6	26	TJS	19:40	22:40	03:00	04:12	22:26
2014	29/06/2014	6	45	CR	19:40	22:40	03:00	04:12	22:26
2014	29/06/2014	6	45	CR	15:20	18:20	03:00	04:12	22:26
2014	29/06/2014	6	47	TJS	11:15	14:15	03:00	04:12	22:26
2014	30/06/2014	6	14	TJS	15:20	17:20	02:00	04:13	22:25
2014	30/06/2014	6	46	JBB	15:00	17:30	02:30	04:13	22:25
2014	03/07/2014	7	17	WR	11:00	14:00	03:00	04:16	22:23
2014	03/07/2014	7	20	CR	10:55	13:55	03:00	04:16	22:23
2014	03/07/2014	7	45	CR	15:45	18:45	03:00	04:16	22:23
2014	03/07/2014	7	45	CR	19:45	22:45	03:00	04:16	22:23
2014	03/07/2014	7	48	WR	15:00	18:00	03:00	04:16	22:23
2014	03/07/2014	7	48	WR	19:35	22:35	03:00	04:16	22:23

Year	Date	Month	Vantage Point	Observer	Start Time	End Time	Duration	Sunrise	Sunset
2014	08/07/2014	7	15	WR	10:30	13:30	03:00	04:22	22:19
2014	08/07/2014	7	26	WR	15:15	18:00	02:45	04:22	22:19
2014	08/07/2014	7	45	WR	19:30	22:30	03:00	04:22	22:19
2014	09/07/2014	7	45	WR	05:00	07:00	02:00	04:23	22:18
2014	09/07/2014	7	48	CR	15:45	18:45	03:00	04:23	22:18
2014	10/07/2014	7	9	CR	19:30	22:30	03:00	04:25	22:16
2014	10/07/2014	7	15	WR	19:30	22:30	03:00	04:25	22:16
2014	10/07/2014	7	17	CR	15:15	18:15	03:00	04:25	22:16
2014	10/07/2014	7	45	WR	15:00	18:00	03:00	04:25	22:16
2014	11/07/2014	7	16	WR	15:30	18:30	03:00	04:26	22:15
2014	11/07/2014	7	16	CR	09:15	12:15	03:00	04:26	22:15
2014	11/07/2014	7	19	CR	04:30	07:30	03:00	04:26	22:15
2014	11/07/2014	7	20	WR	19:30	22:30	03:00	04:26	22:15
2014	11/07/2014	7	26	WR	08:35	11:35	03:00	04:26	22:15
2014	11/07/2014	7	26	WR	04:35	07:35	03:00	04:26	22:15
2014	11/07/2014	7	45	CR	15:30	18:30	03:00	04:26	22:15
2014	11/07/2014	7	45	CR	19:30	22:30	03:00	04:26	22:15
2014	12/07/2014	7	16	CR	04:30	07:30	03:00	04:28	22:14
2014	12/07/2014	7	20	WR	04:30	07:30	03:00	04:28	22:14
2014	14/07/2014	7	9	MSS	19:40	22:40	03:00	04:31	22:11
2014	14/07/2014	7	26	MSS	15:45	18:45	03:00	04:31	22:11
2014	14/07/2014	7	46	CR	12:00	15:00	03:00	04:31	22:11
2014	14/07/2014	7	46	CR	19:30	22:30	03:00	04:31	22:11
2014	14/07/2014	7	48	WR	19:20	22:20	03:00	04:31	22:11
2014	15/07/2014	7	15	WR	15:20	18:20	03:00	04:33	22:09
2014	15/07/2014	7	16	WR	19:20	22:20	03:00	04:33	22:09
2014	15/07/2014	7	19	MSS	19:15	22:15	03:00	04:33	22:09
2014	15/07/2014	7	26	CR	16:10	19:10	03:00	04:33	22:09
2014	15/07/2014	7	26	CR	19:40	22:40	03:00	04:33	22:09
2014	16/07/2014	7	15	MSS	04:10	07:10	03:00	04:35	22:08
2014	16/07/2014	7	48	CR	12:15	15:15	03:00	04:35	22:08
2014	16/07/2014	7	48	CR	15:45	18:45	03:00	04:35	22:08
2014	17/07/2014	7	9	MSS	15:25	18:25	03:00	04:36	22:06
2014	17/07/2014	7	17	MSS	19:05	01:12	03:00	04:36	22:06
2014	17/07/2014	7	19	WR	09:50	12:50	03:00	04:36	22:06
2014	17/07/2014	7	19	WR	13:20	16:20	03:00	04:36	22:06
2014	19/07/2014	7	3	CR	04:20	07:20	03:00	04:40	22:03
2014	19/07/2014	7	3	CR	07:50	10:50	03:00	04:40	22:03
2014	19/07/2014	7	21	WR	04:15	07:15	03:00	04:40	22:03
2014	19/07/2014	7	21	WR	07:45	10:45	03:00	04:40	22:03
2014	20/07/2014	7	3	WR	15:15	18:15	03:00	04:42	22:01
2014	20/07/2014	7	21	CR	15:15	18:15	03:00	04:42	22:01
2014	21/07/2014	7	3	WR	19:10	22:10	03:00	04:44	21:59
2014	21/07/2014	7	18	CR	15:15	18:15	03:00	04:44	21:59
2014	21/07/2014	7	18	CR	19:00	22:00	03:00	04:44	21:59
2014	21/07/2014	7	26	WR	15:30	18:30	03:00	04:44	21:59
2014	22/07/2014	7	9	CR	08:30	11:30	03:00	04:46	21:57
2014	22/07/2014	7	18	CR	04:30	07:30	03:00	04:46	21:57
2014	23/07/2014	7	17	WR	04:25	07:25	03:00	04:48	21:56
2014	23/07/2014	7	17	WR	08:00	11:00	03:00	04:48	21:56
2014	24/07/2014	7	45	TG	04:55	07:55	03:00	04:50	21:54
2014	27/07/2014	7	44	CR	16:20	18:20	02:00	04:56	21:47
2014	27/07/2014	7	44	CR	18:50	21:50	03:00	04:56	21:47
2014	27/07/2014	7	45	CR	11:20	14:40	03:00	04:56	21:47
2014	29/07/2014	7	21	WR	18:45	21:45	03:00	05:00	21:43
2014	29/07/2014	7	26	WR	13:55	16:55	03:00	05:00	21:43
2014	29/07/2014	7	52	CR	14:15	21:05	06:50	05:00	21:43
2014	30/07/2014	7	44	WR	10:00	13:00	03:00	05:02	21:41
2014	30/07/2014	7	44	WR	13:30	14:30	01:00	05:02	21:41
2014	30/07/2014	7	48	CR	10:15	13:15	03:00	05:02	21:41
2014	30/07/2014	7	48	CR	13:45	16:45	03:00	05:02	21:41
2014	30/07/2014	7	48	CR	17:15	20:15	03:00	05:02	21:41
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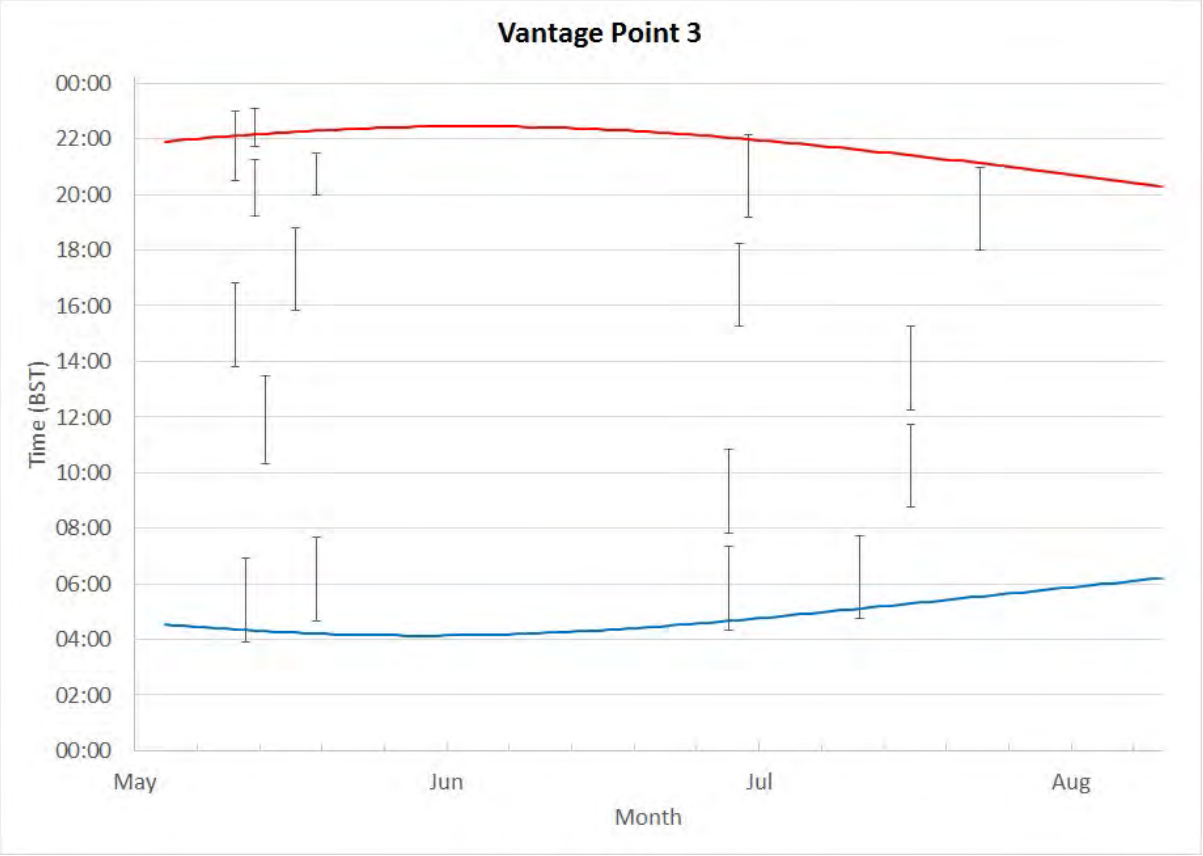
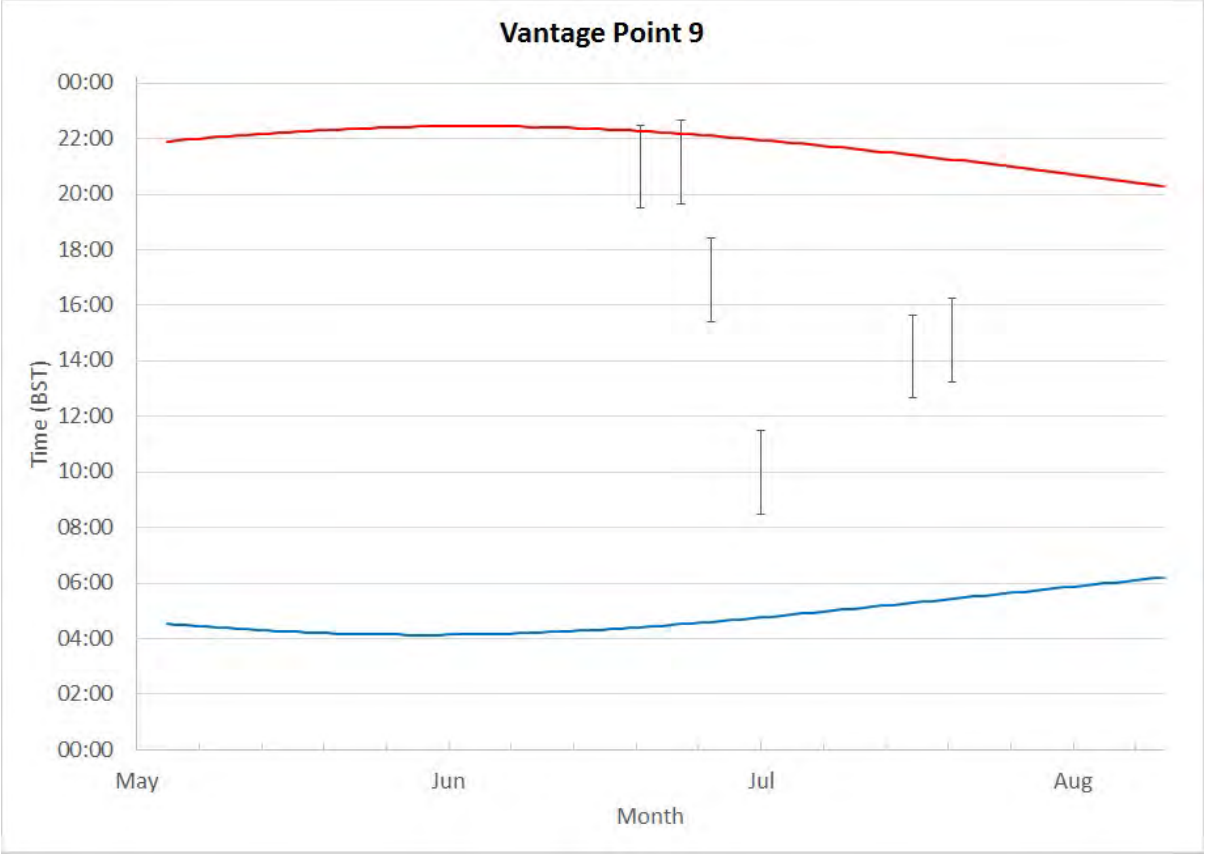
2014	01/08/2014	8	44	CR	08:45	11:45	03:00	05:06	21:37
2014	02/08/2014	8	15	CR	10:00	13:00	03:00	05:08	21:34
2014	02/08/2014	8	15	CR	13:30	16:30	03:00	05:08	21:34
2014	02/08/2014	8	19	WR	09:50	12:50	03:00	05:08	21:34
2014	02/08/2014	8	19	WR	13:20	16:20	03:00	05:08	21:34
2014	04/08/2014	8	16	WR	18:30	21:30	03:00	05:13	21:30

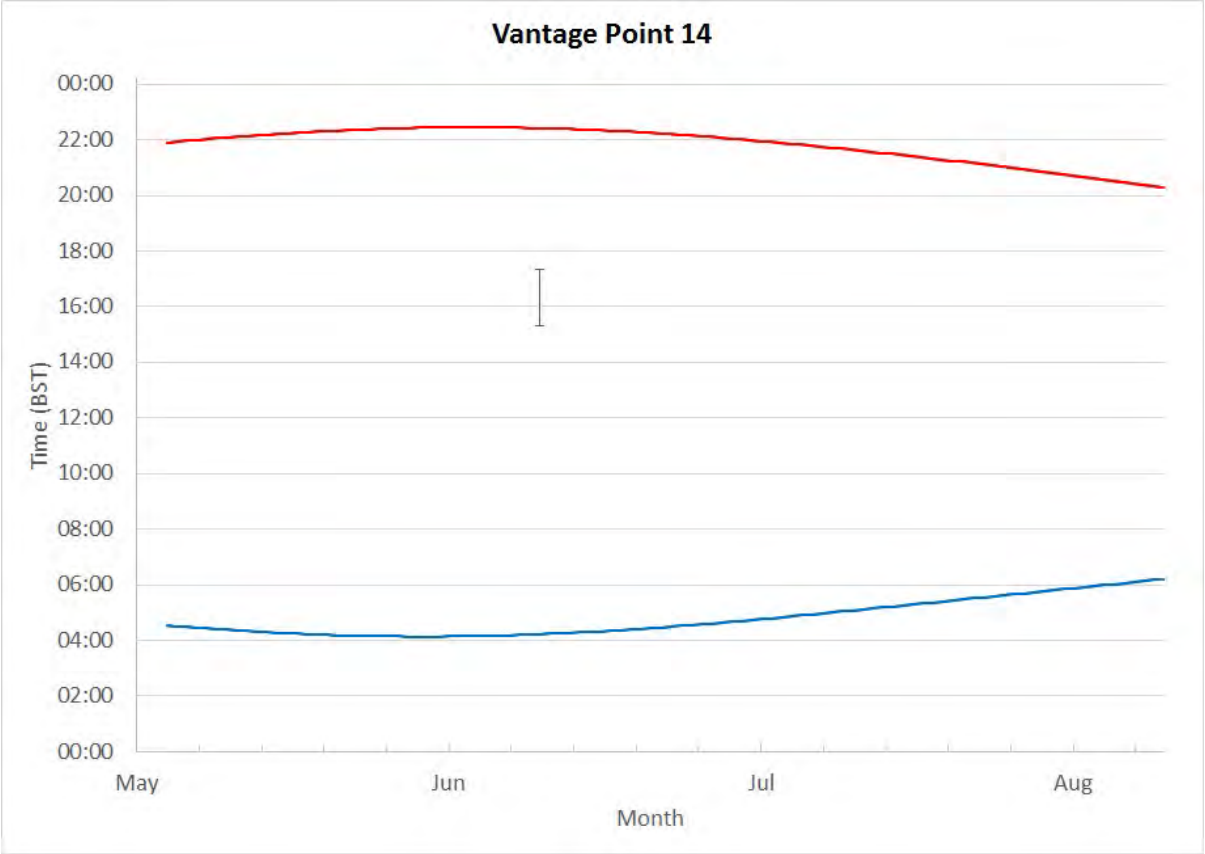
Year	Date	Month	Vantage Point	Observer	Start Time	End Time	Duration	Sunrise	Sunset
2014	04/08/2014	8	20	WR	14:20	17:20	03:00	05:13	21:30
2014	05/08/2014	8	26	WR	13:55	16:55	03:00	05:15	21:27
2014	05/08/2014	8	26	WR	17:30	20:30	03:00	05:15	21:27
2014	06/08/2014	8	3	WR	08:45	11:45	03:00	05:17	21:25
2014	06/08/2014	8	3	WR	12:15	15:15	03:00	05:17	21:25
2014	06/08/2014	8	9	CR	12:40	15:40	03:00	05:17	21:25
2014	06/08/2014	8	17	CR	09:10	12:10	03:00	05:17	21:25
2014	06/08/2014	8	18	CR	05:10	08:10	03:00	05:17	21:25
2014	06/08/2014	8	20	WR	04:45	07:45	03:00	05:17	21:25
2014	07/08/2014	8	21	JBB	05:00	08:00	03:00	05:19	21:22
2014	07/08/2014	8	26	CR	18:30	21:30	03:00	05:19	21:22
2014	07/08/2014	8	45	JBB	09:20	12:20	03:00	05:19	21:22
2014	07/08/2014	8	50	CR	08:00	12:00	03:00	05:19	21:22
2014	07/08/2014	8	50	CR	13:00	16:00	03:00	05:19	21:22
2014	08/08/2014	8	15	JBB	19:15	22:15	03:00	05:21	21:20
2014	08/08/2014	8	48	CR	11:45	14:45	03:00	05:21	21:20
2014	08/08/2014	8	48	CR	15:15	18:15	03:00	05:21	21:20
2014	09/08/2014	8	21	CR	10:00	13:00	03:00	05:24	21:17
2014	09/08/2014	8	44	CR	14:20	17:20	03:00	05:24	21:17
2014	09/08/2014	8	44	CR	18:20	21:20	03:00	05:24	21:17
2014	10/08/2014	8	9	CR	13:15	16:15	03:00	05:26	21:15
2014	10/08/2014	8	17	CR	05:15	08:15	03:00	05:26	21:15
2014	10/08/2014	8	18	CR	09:15	12:15	03:00	05:26	21:15
2014	10/08/2014	8	49	JBB	18:00	20:15	02:15	05:26	21:15
2014	11/08/2014	8	20	WR	15:15	18:15	03:00	05:28	21:12
2014	11/08/2014	8	21	CR	14:55	17:55	03:00	05:28	21:12
2014	12/08/2014	8	16	WR	14:25	17:25	03:00	05:30	21:10
2014	12/08/2014	8	17	CR	14:30	17:30	03:00	05:30	21:10
2014	12/08/2014	8	18	CR	18:00	21:00	03:00	05:30	21:10
2014	12/08/2014	8	19	WR	18:00	21:00	03:00	05:30	21:10
2014	13/08/2014	8	3	WR	18:00	21:00	03:00	05:32	21:07
2014	13/08/2014	8	17	CR	18:00	21:00	03:00	05:32	21:07
2014	13/08/2014	8	18	CR	14:30	17:30	03:00	05:32	21:07
2014	13/08/2014	8	26	WR	14:20	17:20	03:00	05:32	21:07
2014	14/08/2014	8	48	CR	11:05	14:05	03:00	05:35	21:05
2014	14/08/2014	8	48	CR	14:35	17:35	03:00	05:35	21:05
2014	15/08/2014	8	15	WR	05:10	08:10	03:00	05:37	21:02
2014	15/08/2014	8	16	CR	09:10	12:10	03:00	05:37	21:02
2014	15/08/2014	8	19	CR	05:10	08:10	03:00	05:37	21:02
2014	15/08/2014	8	26	WR	09:10	12:10	03:00	05:37	21:02
2014	16/08/2014	8	16	CR	05:30	08:30	03:00	05:39	21:00
2014	16/08/2014	8	20	CR	09:30	12:30	03:00	05:39	21:00
2014	16/08/2014	8	49	JBB	17:20	20:20	03:00	05:39	21:00
2014	19/08/2014	8	48	WR	14:15	16:15	02:00	05:46	20:52
2014	21/08/2014	8	20	WR	17:45	20:45	03:00	05:50	20:46
2014	22/08/2014	8	44	WR	05:30	08:30	03:00	05:52	20:44
2014	26/08/2014	8	21	WR	17:30	20:30	03:00	06:01	20:33
2014	26/08/2014	8	26	WR	13:00	16:00	03:00	06:01	20:33
2014	27/08/2014	8	48	WR	10:30	13:30	03:00	06:03	20:30
2014	29/08/2014	8	18	WR	09:50	12:50	03:00	06:08	20:24

APPENDIX 2 – SURVEY TIMINGS FROM VANTAGE POINT SURVEYS 2014

Black solid vertical line indicates duration of vantage point survey.




Vantage Point 9
00:00
22:00
20:00
18:00
16:00
14:00
12:00
10:00
08:00
06:00
04:00
02:00
00:00
Time (BST)
May
Jun
Jul
Aug
Month


Vantage Point 14
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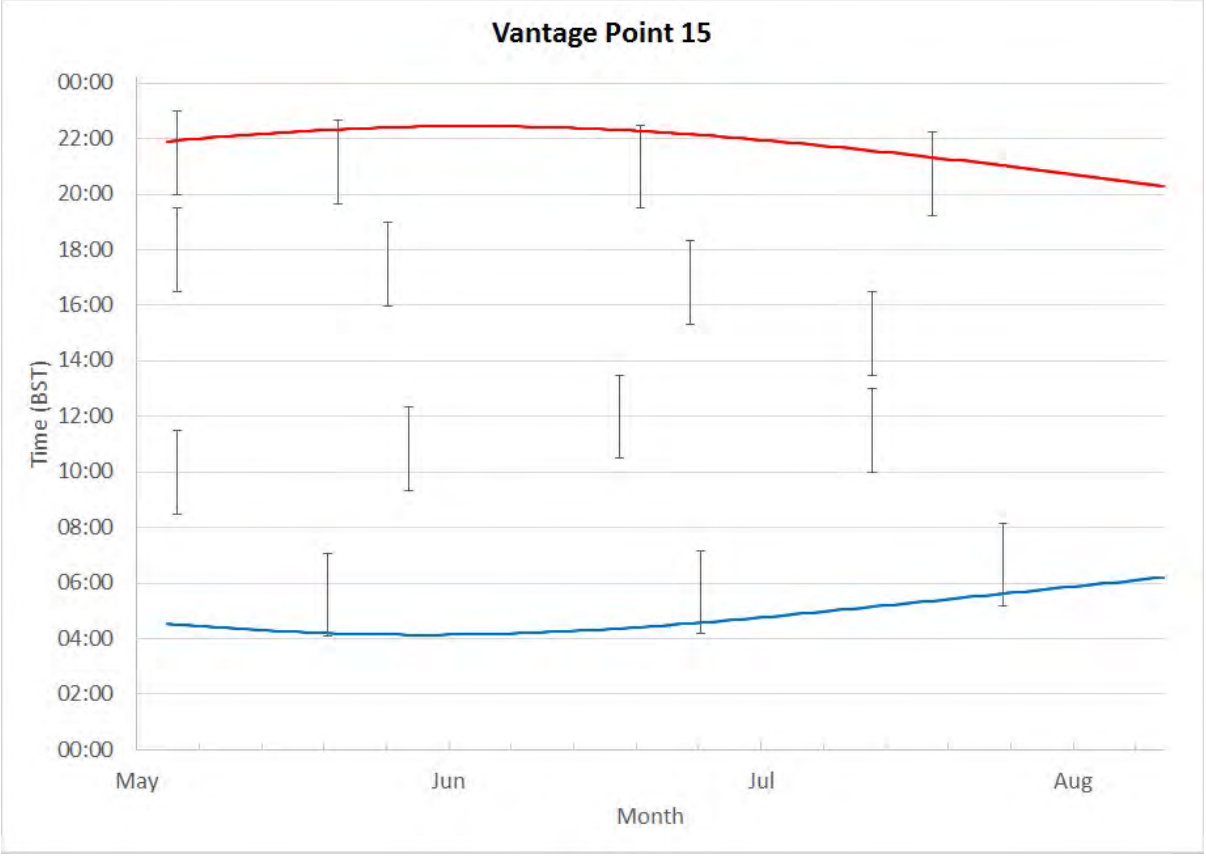
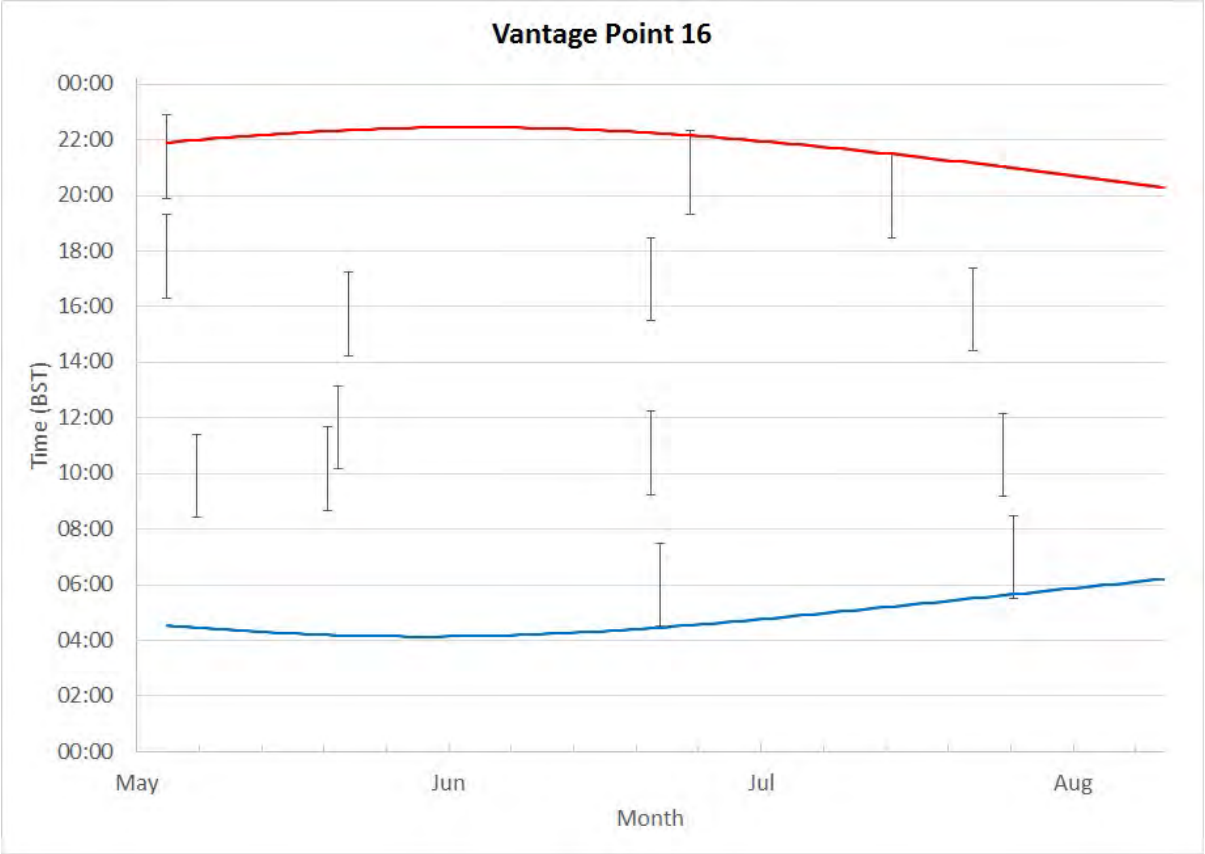
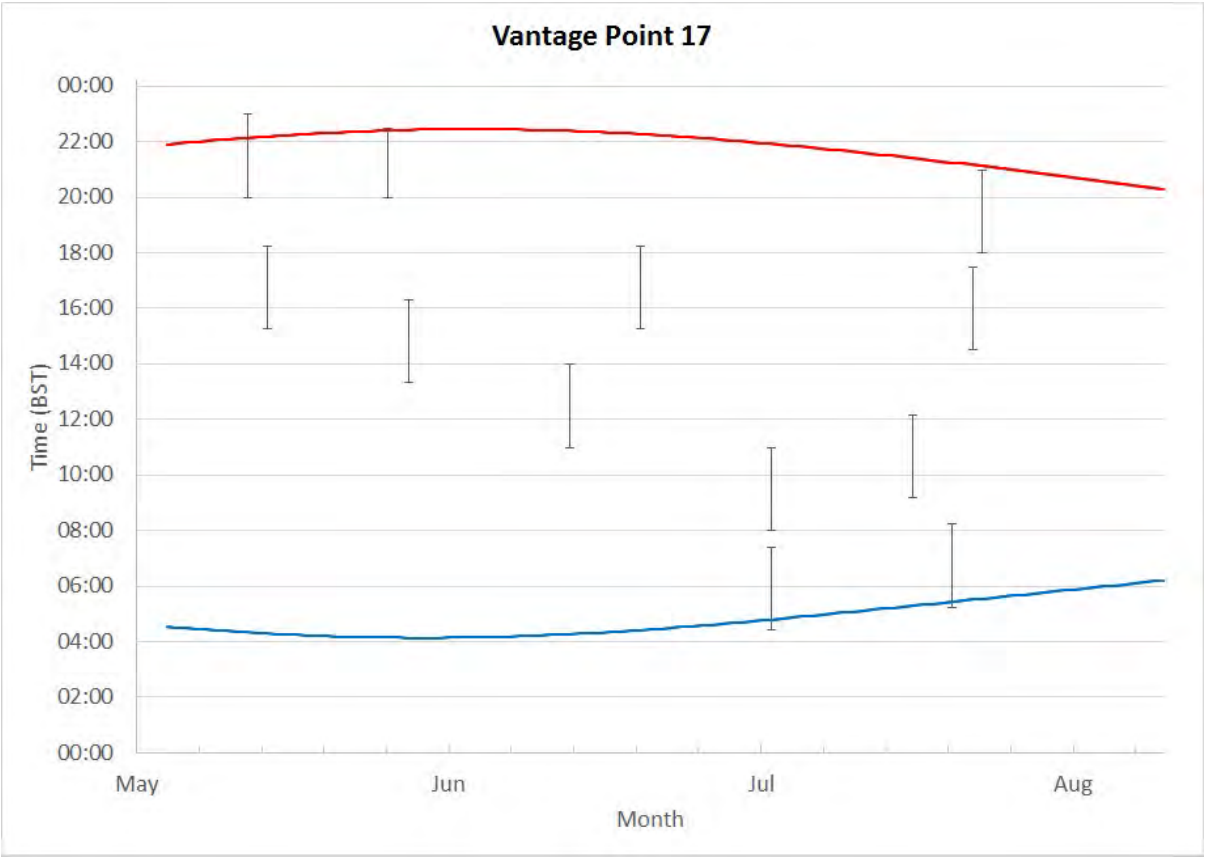
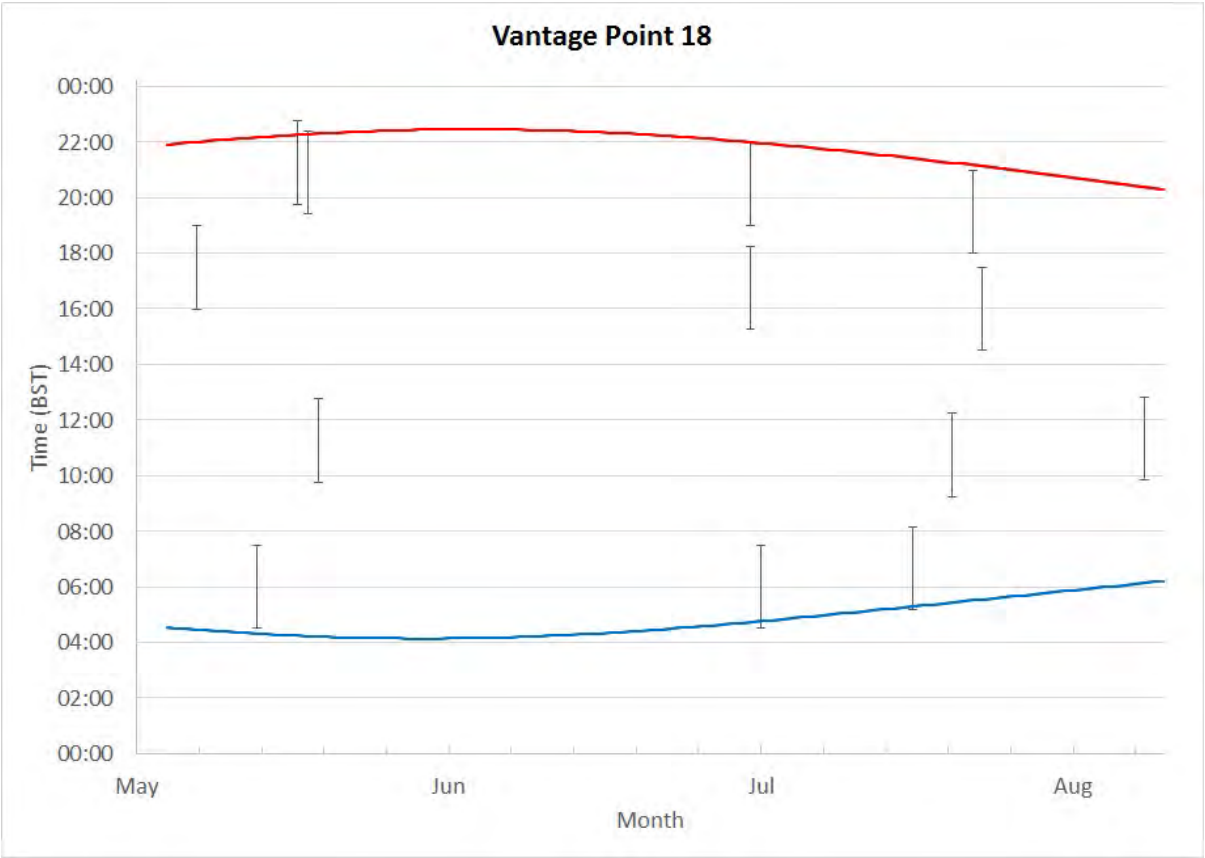
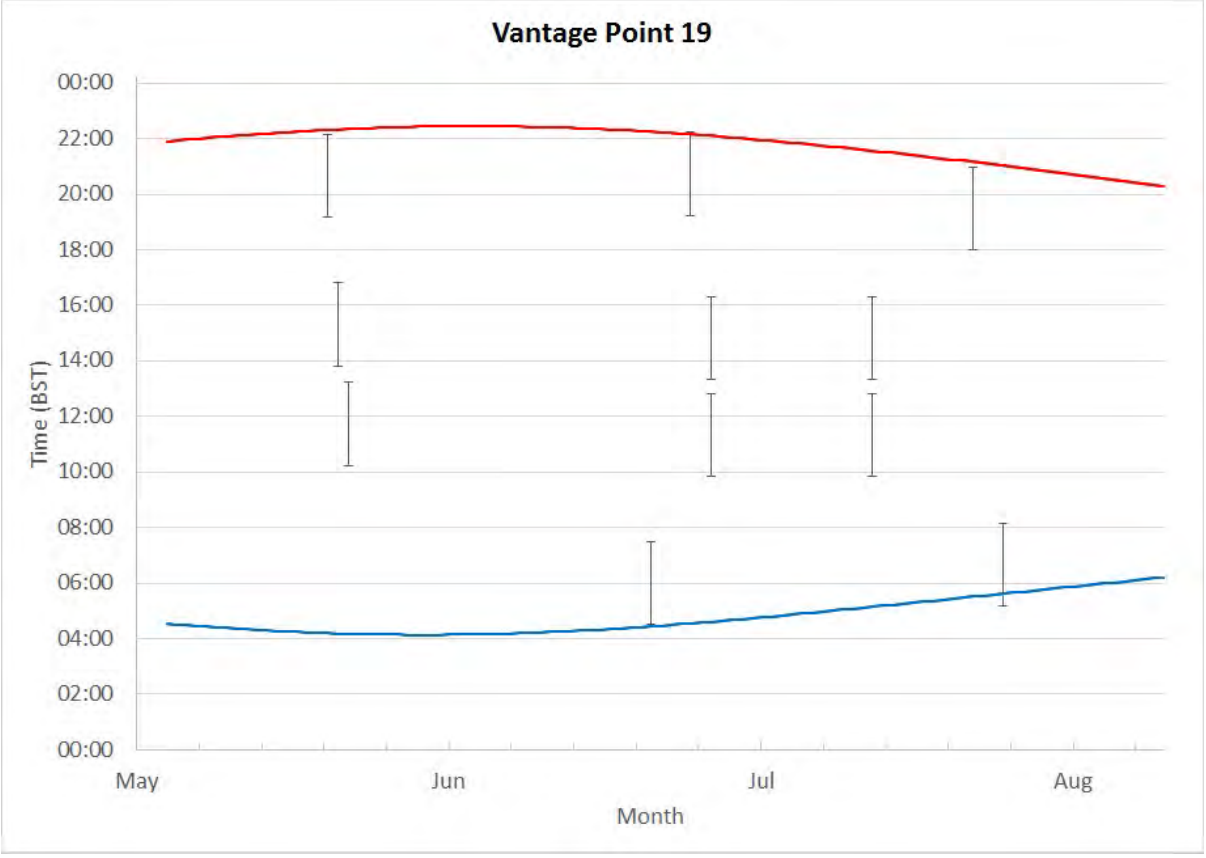
22:00
20:00
18:00
16:00
14:00
12:00
10:00
08:00
06:00
04:00
02:00
00:00
Time (BST)
May
Jun
Jul
Aug
Month


Vantage Point 15
00:00
22:00
20:00
18:00
16:00
14:00
12:00
10:00
08:00
06:00
04:00
02:00
00:00
Time (BST)
May
Jun
Jul
Aug
Month


Vantage Point 16
00:00
22:00
20:00
18:00
16:00
14:00
12:00
10:00
08:00
06:00
04:00
02:00
00:00
Time (BST)
May
Jun
Jul
Aug
Month


Vantage Point 17
00:00
22:00
20:00
18:00
16:00
14:00
12:00
10:00
08:00
06:00
04:00
02:00
00:00
Time (BST)
May
Jun
Jul
Aug
Month


Vantage Point 18
00:00
22:00
20:00
18:00
16:00
14:00
12:00
10:00
08:00
06:00
04:00
02:00
00:00
Time (BST)
May
Jun
Jul
Aug
Month


Vantage Point 19
00:00
22:00
20:00
18:00
16:00
14:00
12:00
10:00
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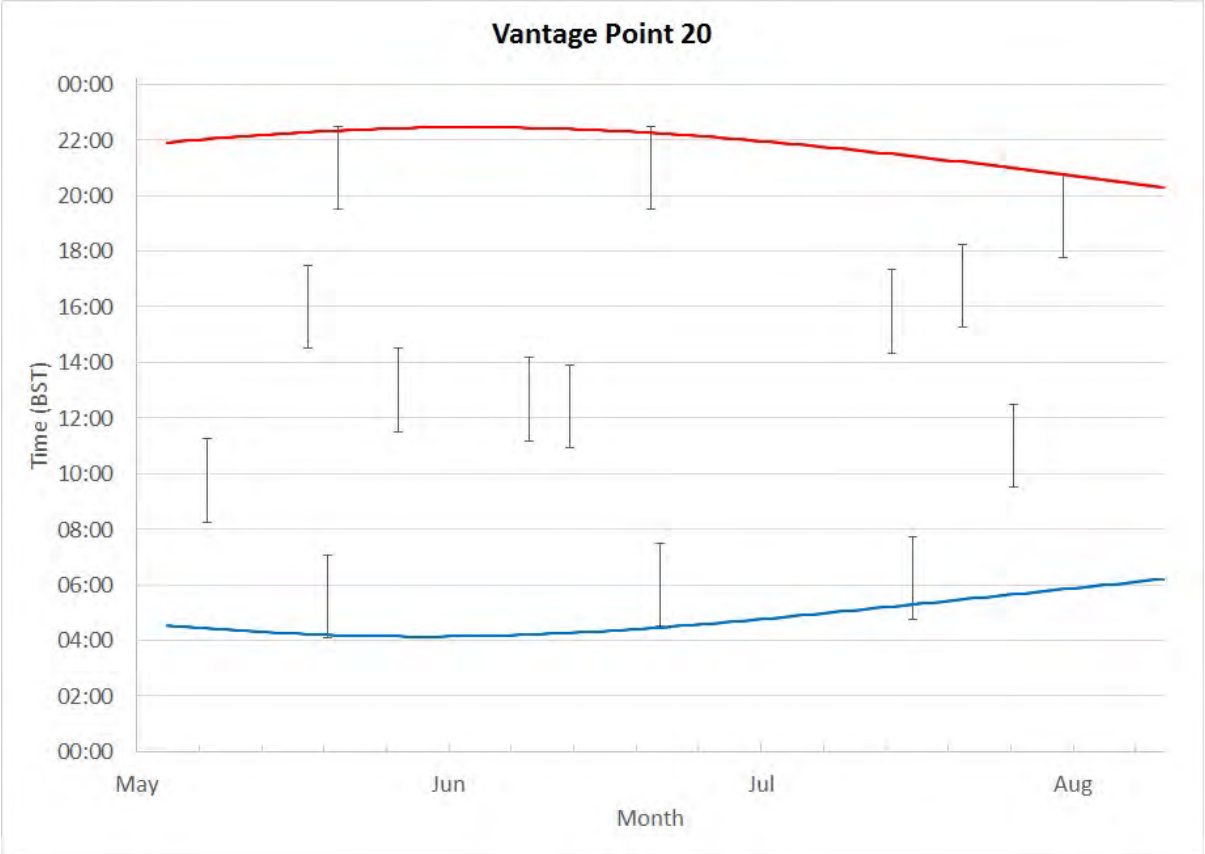
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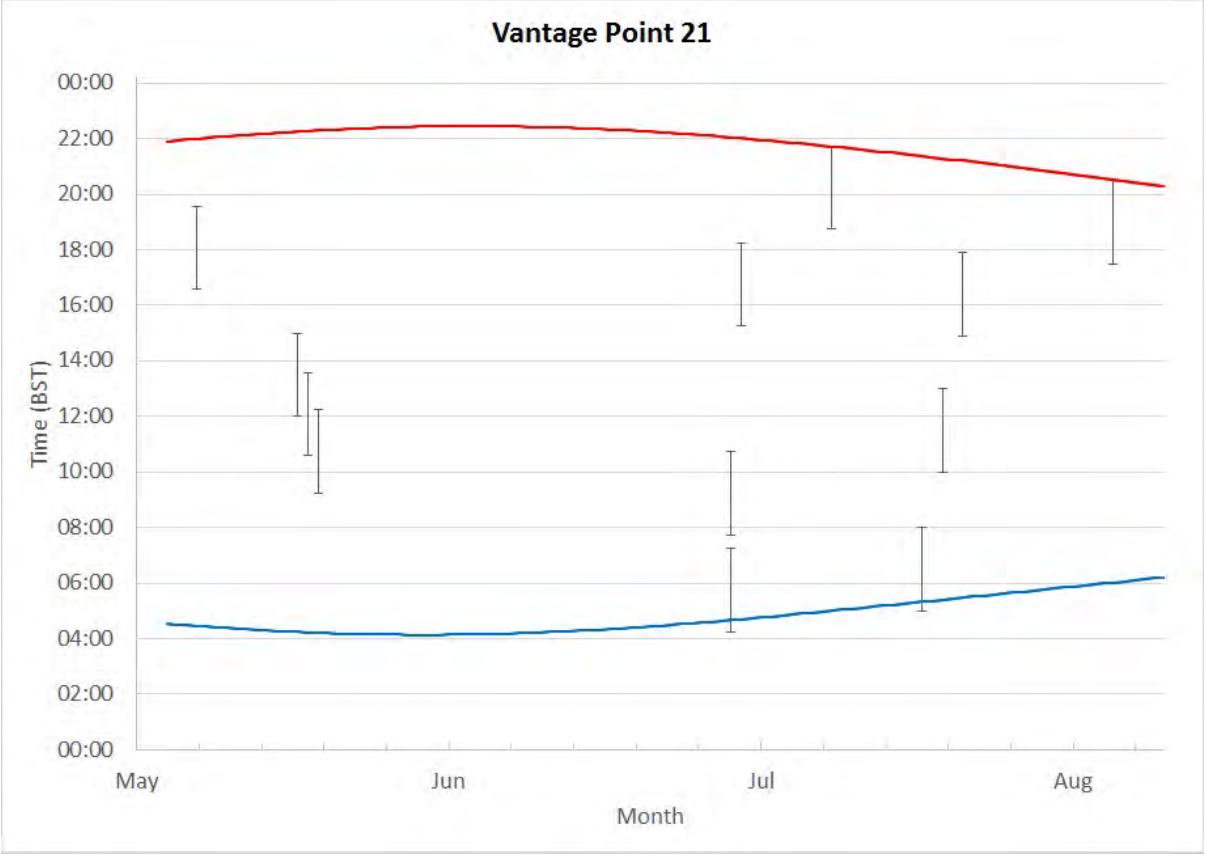
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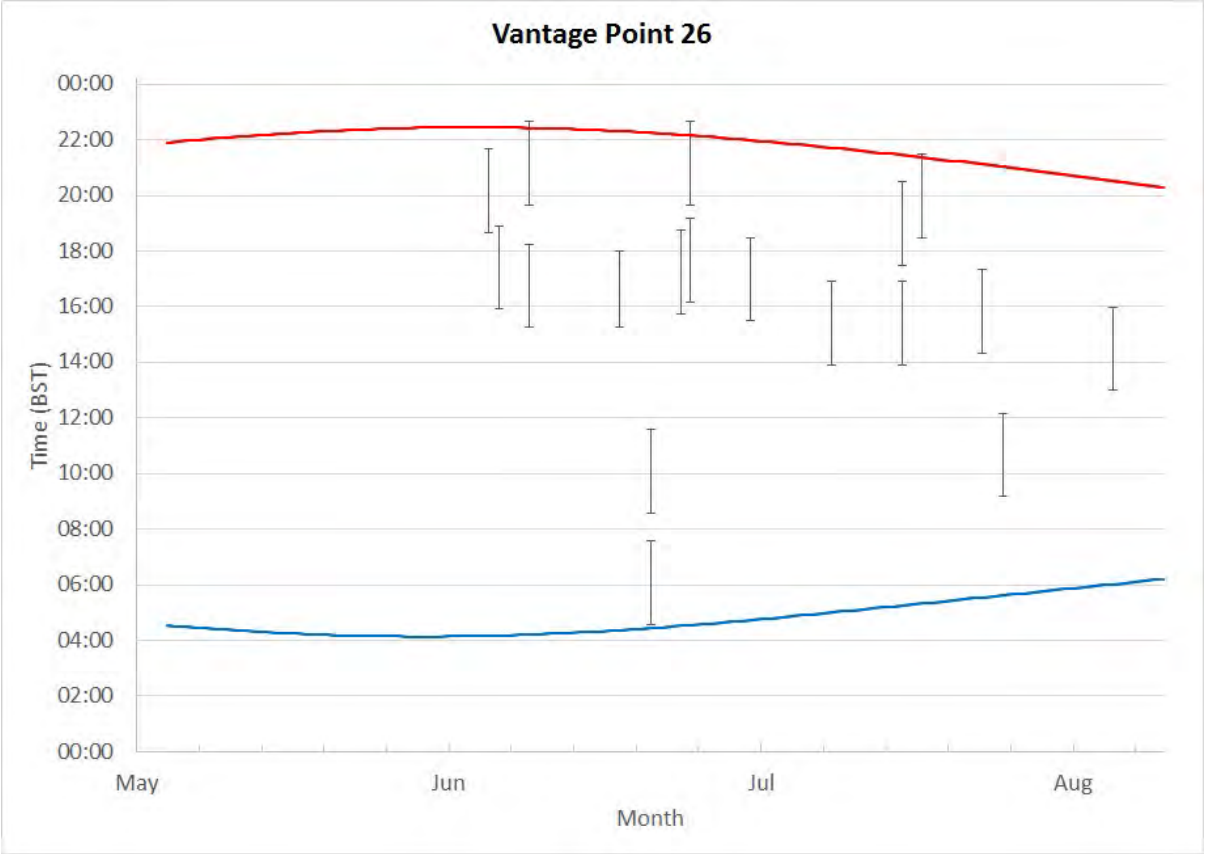
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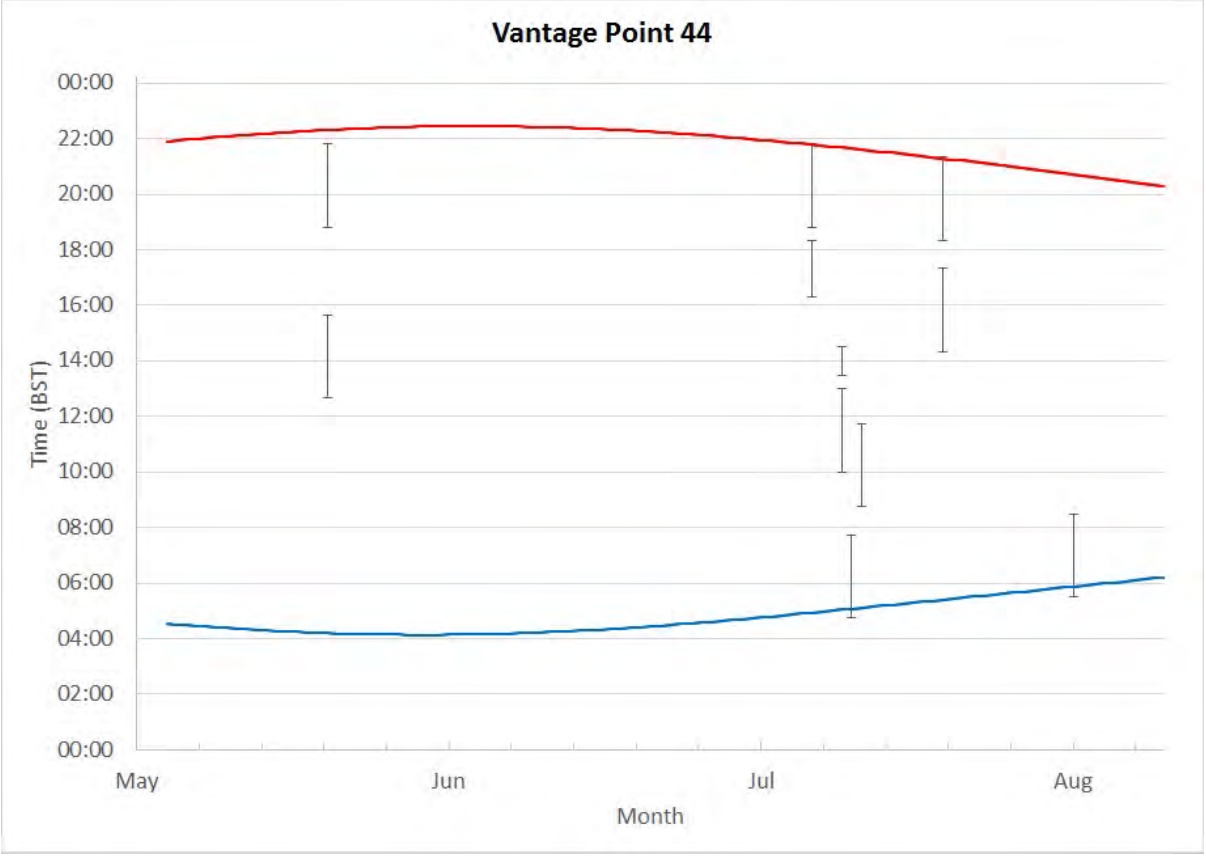
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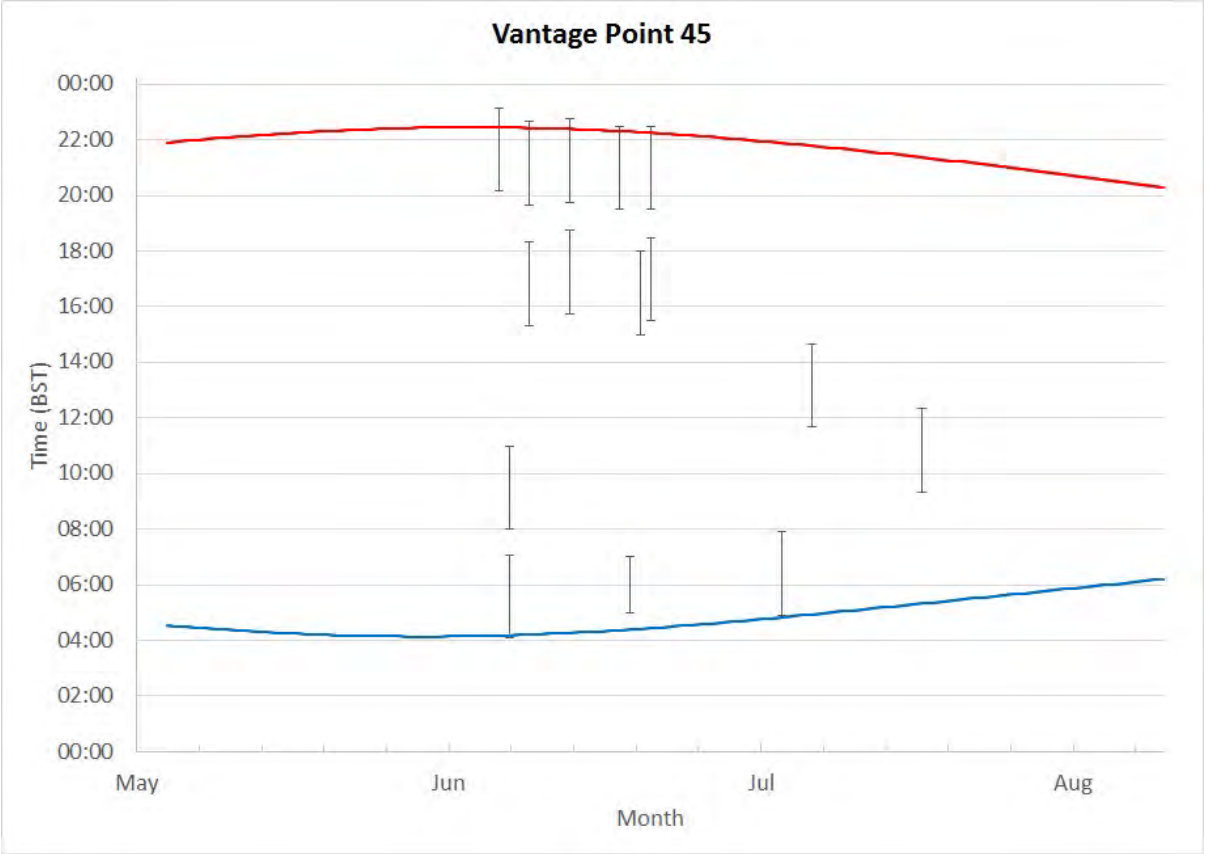
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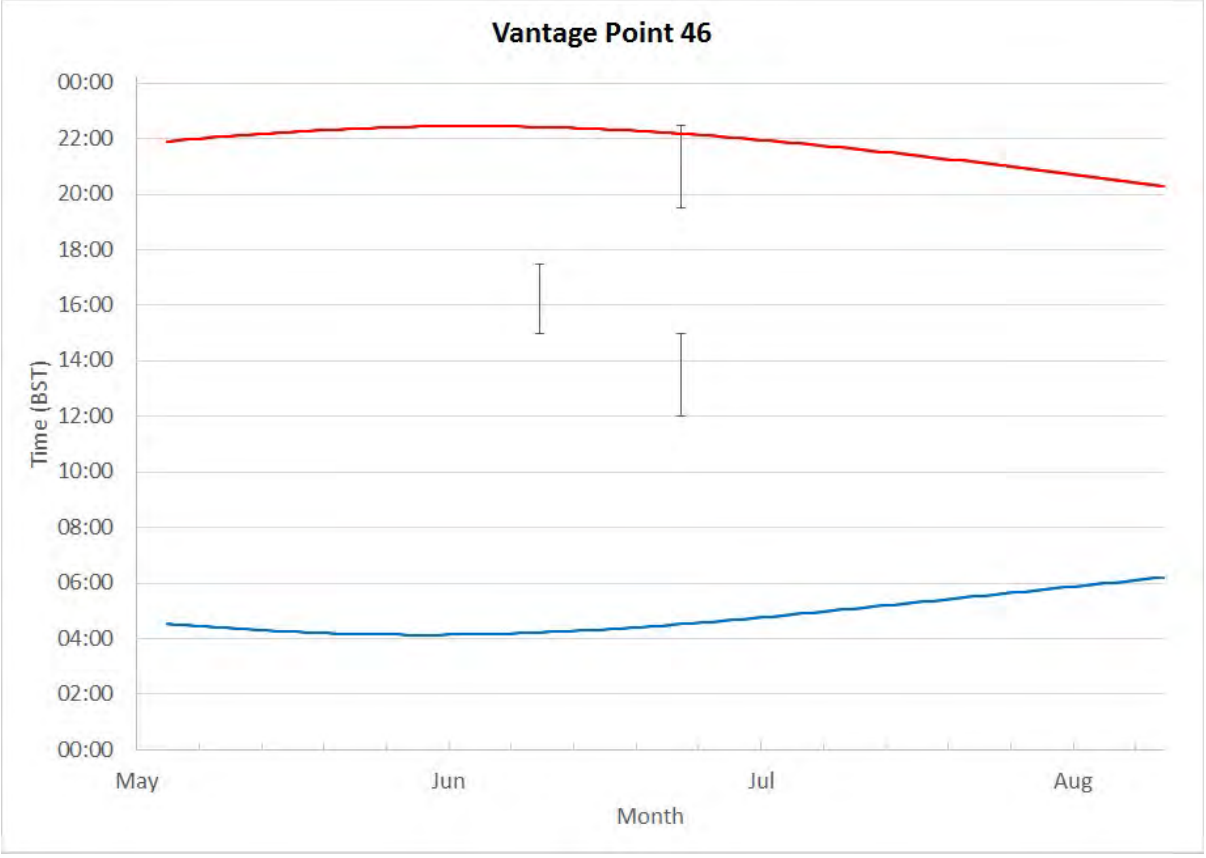
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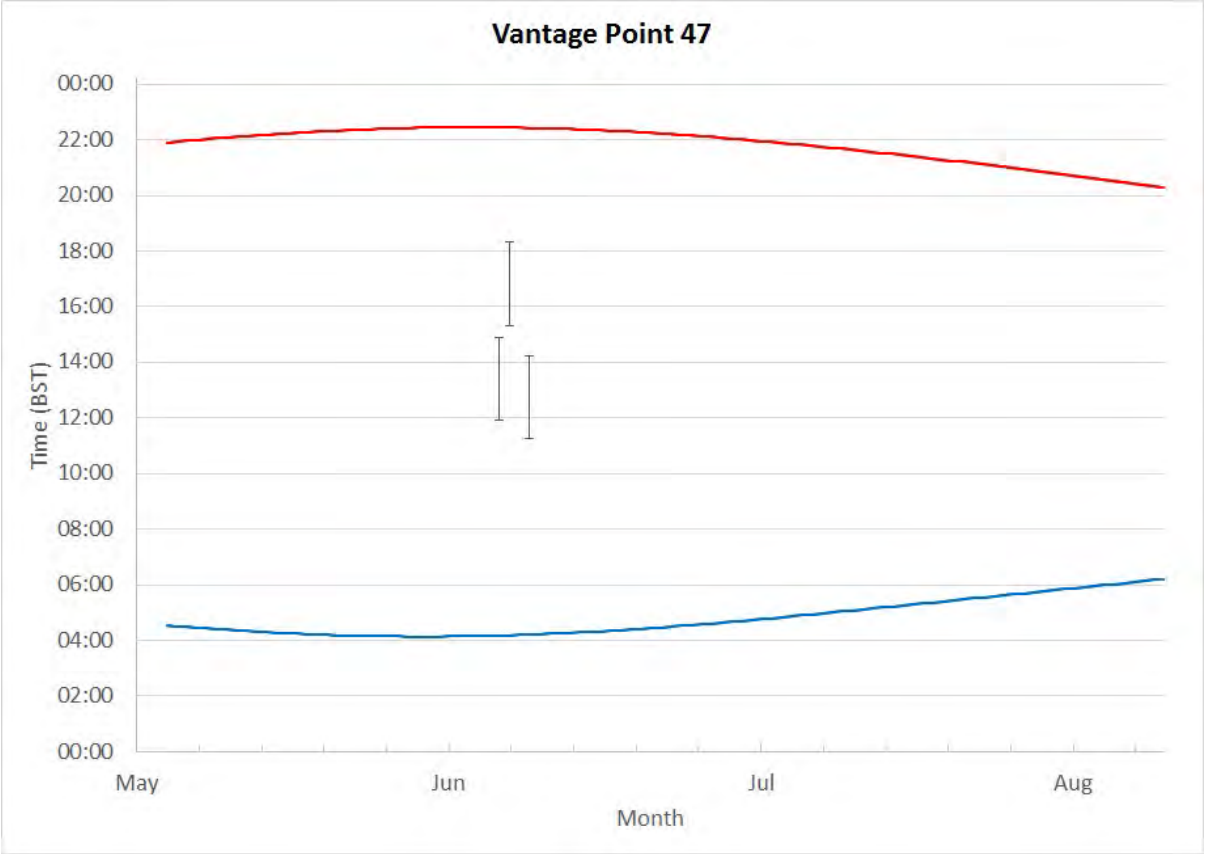
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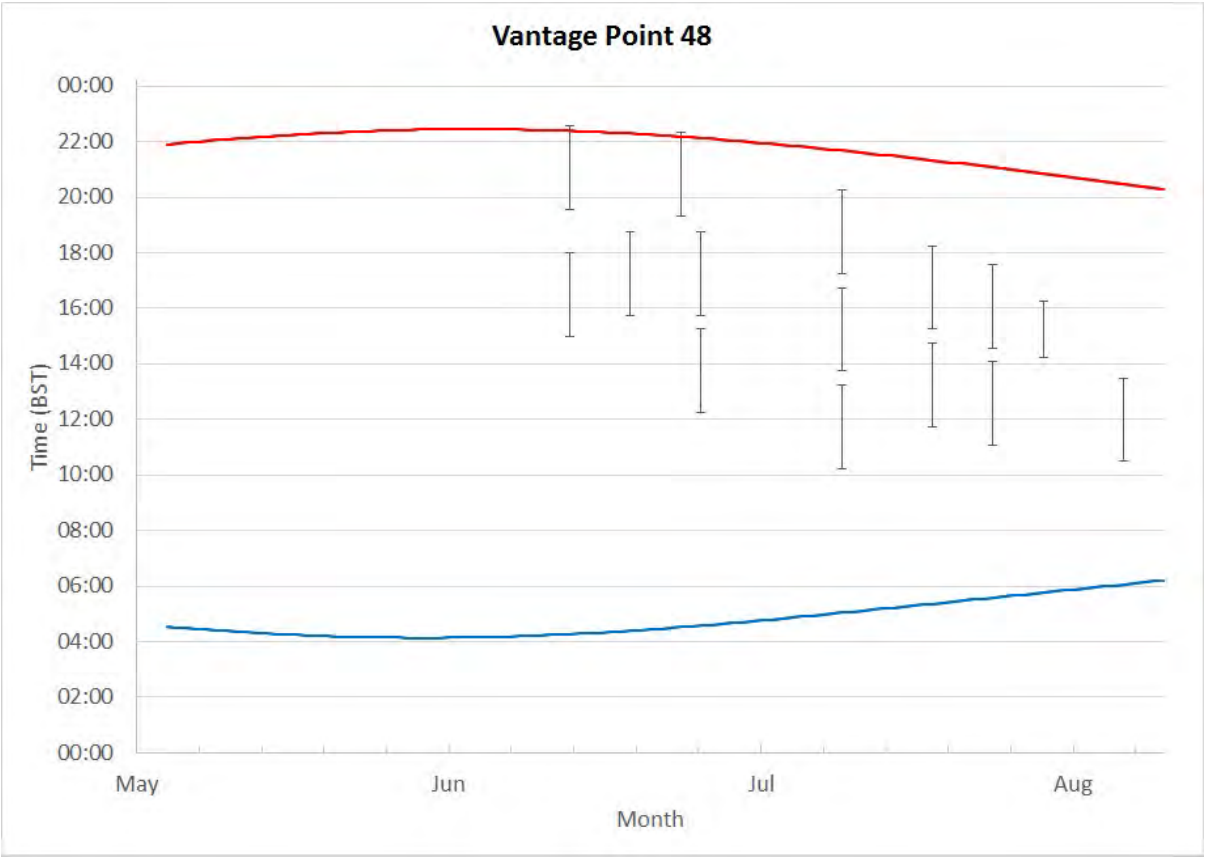
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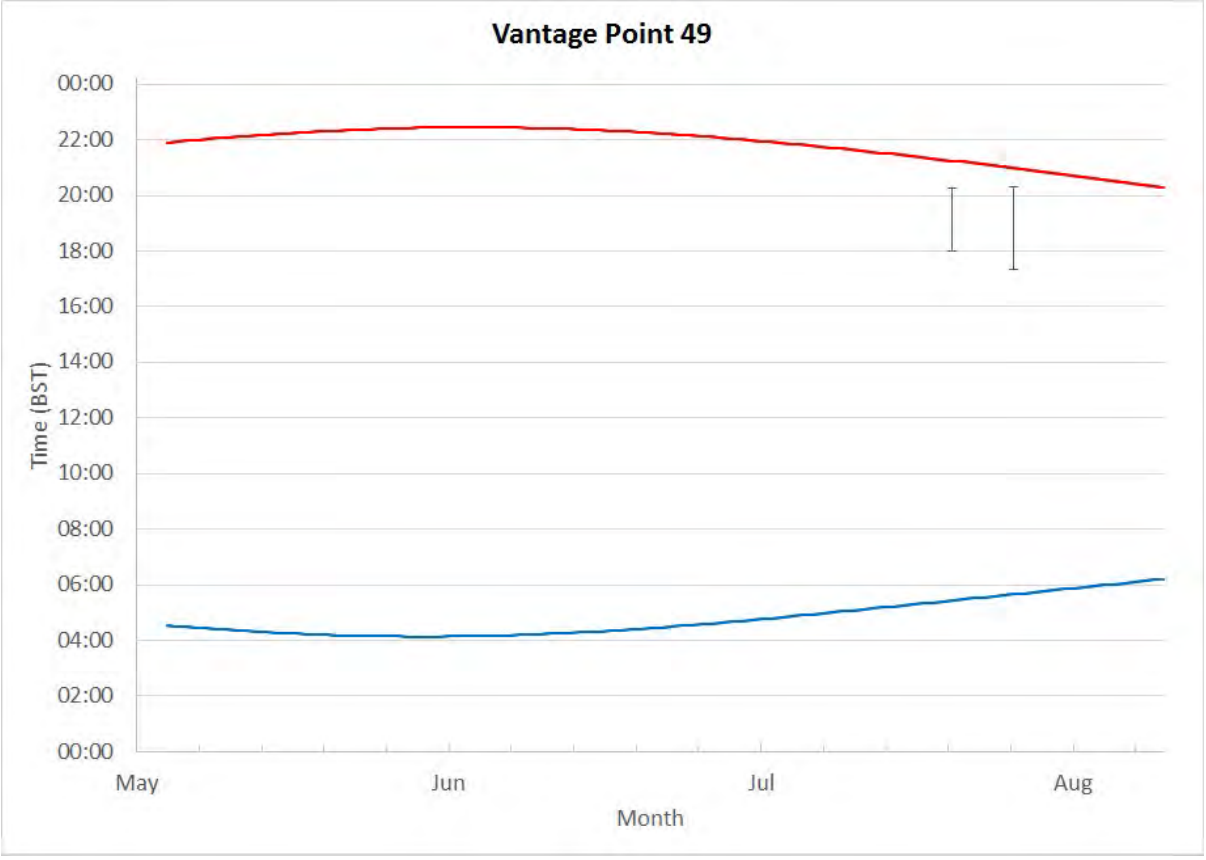
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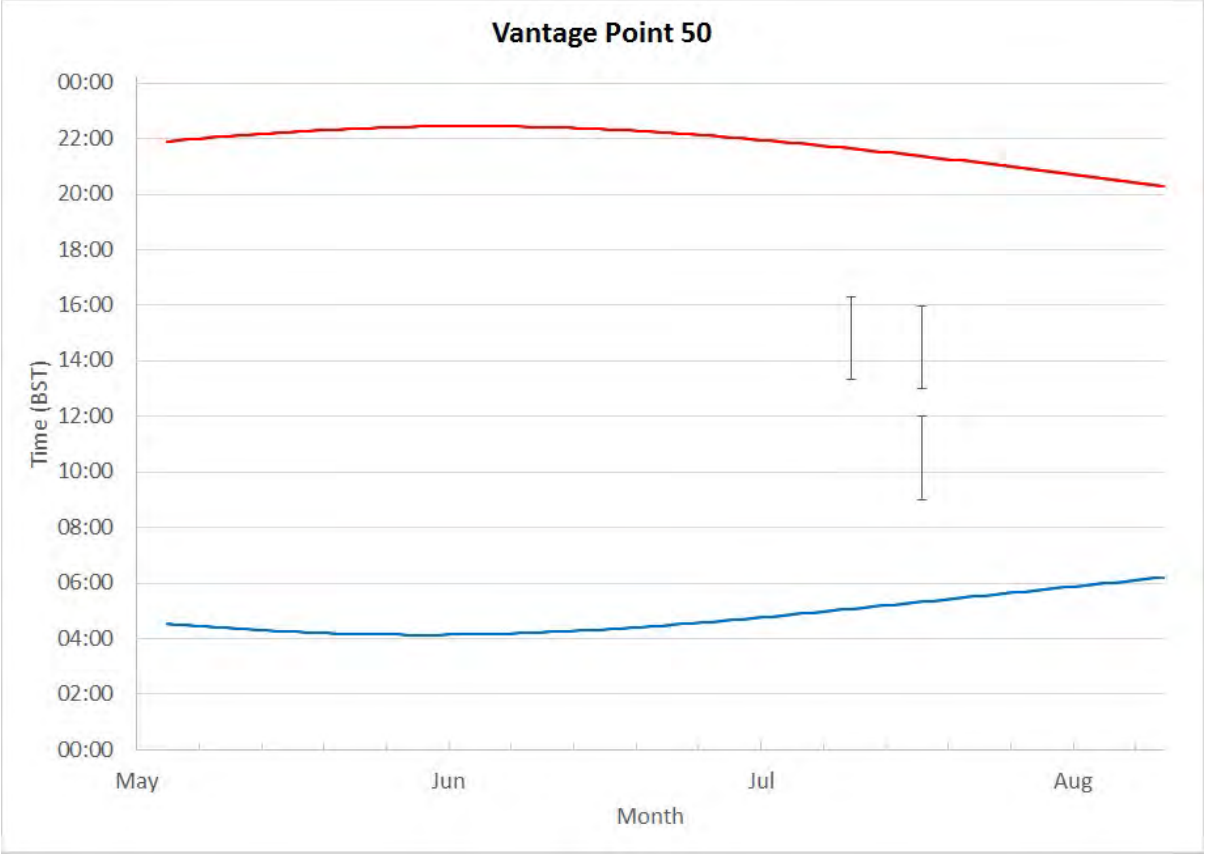
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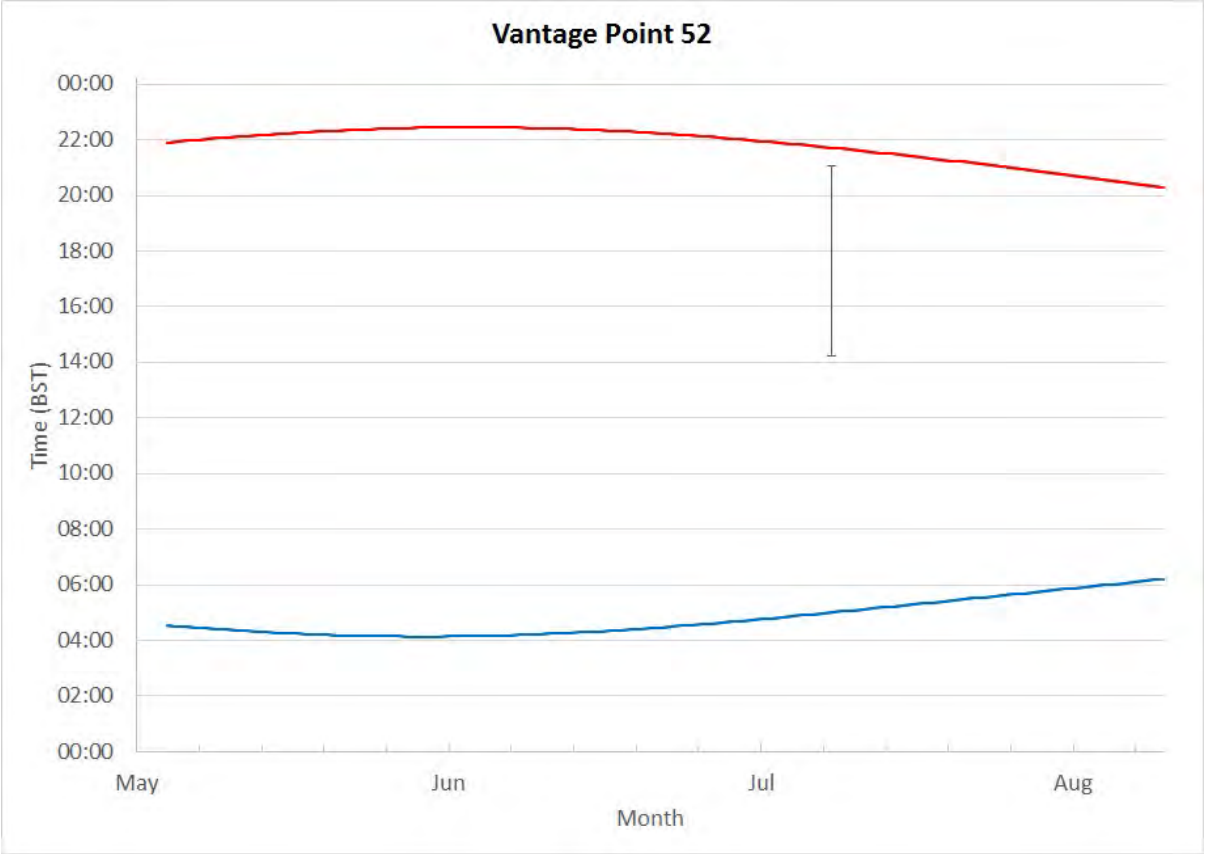
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APPENDIX 3 – GREENSHANK AND RED-THROATED DIVER RECORDS FROM STANDARD VANTAGE POINT SURVEYS IN 2014

Date	Flight ID	Species	Vantage Point	Number of Birds	Duration (Seconds)
06/06/2014	505	GK	21	1	135
06/06/2014	570	GK	21	1	135
10/06/2014	522	GK	15	1	45
10/06/2014	523	GK	15	1	90
15/06/2014	556	GK	15	2	90
15/06/2014	557	GK	15	1	30
10/07/2014	572	GK	15	1	15
10/07/2014	573	GK	15	1	15
10/07/2014	574	GK	15	1	15
10/07/2014	575	GK	15	1	30
10/07/2014	576	GK	15	1	30
10/07/2014	577	GK	15	3	30
11/07/2014	584	RH	19	1	75
11/07/2014	581	GK	16	1	30
11/07/2014	582	GK	16	1	30
16/07/2014	578	GK	15	1	45
16/07/2014	579	GK	15	1	30
19/07/2014	587	GK	3	1	240
22/07/2014	612	RH	18	2	165
10/08/2014	601	RH	17	5	75
10/08/2014	602	RH	17	1	615
10/08/2014	614	RH	17	3	225
15/08/2014	609	RH	16	2	150
21/08/2014	608	RH	20	2	270

APPENDIX 4 – CONSULTATION BETWEEN THE APPLICANT, RPS AND SNH SINCE THE SUBMISSION OF THE 2013 ES ADDENDUM

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

Year of Natural Scotland 2013

Gordon Brown
Energy Consents and Deployment Unit
4th Floor
5 Atlantic Quay
150 Broomielaw
Glasgow
G2 8LU

20 November 2013
By email only to EconsentsAdmin@scotland.gsi.gov.uk

Dear Mr Brown

Electricity Act 1989
The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000
Section 36 Addendum on the proposed Strathy South Wind Farm

Thank you for your email dated 14 August 2013 requesting our advice on the above proposal and for agreeing to an extension to the consultation period.

1. Summary

Caithness and Sutherland Peatlands Special Protection Area (SPA)
The proposal could raise natural heritage issues of national interest and we therefore maintain our objection to the proposal until further information is obtained from the applicant.

Caithness and Sutherland Peatlands Special Area of Conservation (SAC)
The proposal could raise natural heritage issues of national interest and we therefore maintain our objection to the proposal until further information is obtained from the applicant.

2. Background

This response provides our advice on the information contained within the addendum and confirmation of previous recommendations identified for mitigation from our letters dated 25 September 2007 and 2 October 2007.

3. Appraisal of the impacts of the proposal and advice

For the below SPA and SAC sites, the status of each site means that the requirements of either the Conservation (Natural Habitats, &c.) Regulations 1994 as amended, (the 'Habitats Regulations') apply, or (for reserved matters), the Conservation or Habitats and Species Regulations 2010 as amended apply. See http://www.snh.gov.uk/docs/A423286.pdf for a summary of the legislative requirements. In our view, from the information available, it appears that in this case the proposal is not connected with or necessary for the conservation management of the sites. Hence further consideration is required.

3.1 Caithness and Sutherland Peatlands SPA

a. Red-throated diver

In our view, there is insufficient information to determine whether the proposal is likely to have a significant effect on the red-throated diver qualifying interest of the site. In order for this to be determined, we recommend the following additional information is obtained:

- A worked example for red-throated diver collision risk calculations to demonstrate the method of working to allow us to check the quoted figures. Provision of more robust data on preferred flight lines of divers using lochan 64.

Once this information has been provided we will be able to give further consideration to this proposal. **We therefore object to the proposal as currently submitted.**

b. Hen harrier

In our view, this proposal is likely to have a significant effect on the hen harrier qualifying interest of the site. In order for this to be determined, we recommend that the following additional information is obtained:

- A worked example for hen harrier collision risk calculations to demonstrate the method of working to allow us to check the quoted figures.

Once this information has been provided we will be able to give further consideration to this proposal. **We therefore object to the proposal as currently submitted.**

We provide further advice on red-throated diver and hen harrier in Annex 1 of this letter.

c. Greenshank, black-throated diver, wood sandpiper, golden eagle

In our view, this proposal is likely to have a significant effect on the greenshank, black-throated diver, wood sandpiper and golden eagle qualifying interests of the site.

Greenshank

We cannot conclude that predicted collision values for greenshank are accurate (within the constraints of collision risk modelling). Therefore on a precautionary basis, given that greenshank densities are high, we cannot safely conclude that there will not be an adverse effect on site integrity for greenshank within the SPA.

Black-throated diver

The lack of specific evidence to inform an assessment of wind farm disturbance on this species, together with its scarcity in Scotland, suggests that a precautionary approach to assessment is appropriate. At present it cannot be ruled out that displacement and permanent loss of one breeding pair from the SPA would occur which would adversely affect the population.

Wood sandpiper

On the basis of information available, we advise that the proposed wind farm may displace (or disturb) one pair of breeding wood sandpiper. We also advise that the proposed wind farm may lead to the loss, through collision, of one pair of breeding wood sandpiper that could adversely affect the population of the species as a component of the SPA.

Golden eagle

One eagle nest site is located c.2.5km south of the Strathy South site boundary. Forestry clearance and wind farm construction are considerably more disruptive than most other activities that can cause eagle disturbance. The location of the eyrie with respect to the wind farm suggests that it may be particularly vulnerable.

As a consequence, the Scottish Government is required to carry out an appropriate assessment in view of the site's conservation objectives for its qualifying interests. To help you do this, we would further advise that in our view on the basis of appraisal carried out to date, if the proposal is undertaken strictly in accordance with the following changes and mitigation, then the proposal will not adversely affect the integrity of the site:

- Greenshank: Removal of turbines within 800m of greenshank territories to mitigate effects on breeding greenshank;
- Black-throated diver: Removal of turbines 55, 62, 63, 68, 73 and 74 to mitigate effects on breeding black-throated diver;
- Wood sandpiper: Removal of turbine 51 to mitigate effects on breeding wood sandpiper;
- Golden eagle: No forest removal or wind farm construction operations within 3.5km of the nest site during the period February to August inclusive to mitigate for breeding golden eagle.

The appraisal we carried out considered the impact of the proposals on a number of factors as described in Annex 1 of this letter.

Since the proposed development raises natural heritage issues of national interest, **we object to this proposal unless it is made subject to these changes and mitigation measures.**

d. Golden plover, dunlin, merlin, short-eared owl, wigeon and common scoter

For these qualifying species we consider it is unlikely that the proposal will have a significant effect either directly or indirectly. An appropriate assessment is therefore not required.
It is concluded that this proposal will not adversely affect the population size of these species in isolation or in combination with other proposals.

3.2 Caithness and Sutherland Peatlands SAC

a. Blanket bog and wet heath habitats

i) Access track passing places

In our view, there is insufficient information to determine whether the proposal is likely to have a significant effect on the qualifying interests of the site. In order for this to be determined, we recommend the following additional information is obtained:

- The location of two passing places on the main access route within the Caithness and Sutherland Peatlands SAC.

It is identified that two passing places will be required on the access track which runs through the SAC. However, their locations are not identified. It is asserted that the passing places will not result in any direct loss of qualifying habitat, but it is unclear how certain this can be in the absence of at least provisional locations. Therefore we cannot be certain that the operation will not have a significant effect on these qualifying interests. Once this information has been provided we will be able to give further consideration to this proposal. **We therefore object to the proposal as currently submitted.**

Our objection can be removed if it is demonstrated that the passing places will not result in the loss of qualifying habitat.

ii) Peat Landslide and Hazard Risk Assessment

In our view, there is insufficient information to determine whether the proposal is likely to have a significant effect on the qualifying interests of the site. In order for this to be determined, we recommend the following additional information is obtained:

- The inclusion of the Caithness and Sutherland Peatlands SAC as an environmental receptor in the Peat Landslide and Hazard Risk Assessment and the presentation of the assessment in a manner which is sufficiently transparent to enable verification of its conclusions.

A 'Peat Landslide and Hazard Risk Assessment' has been presented as part of the addendum. However, this SAC has not been recognised as an environmental receptor. The assessment also lacks transparency in a number of key areas. At present it cannot be demonstrated that this SAC is not at risk of loss or damage resulting from a peat slide triggered by the construction and/or operation of the wind farm. Therefore we cannot be certain that the operation will not have a significant effect on the qualifying interests. **We therefore object to the proposal as currently submitted.**

Our objection can be removed if it is demonstrated that the SAC is not at risk of loss or damage resulting from a peat slide triggered by the construction and/or operation of the wind farm and the assessment is presented in a manner which enables independent verification of its conclusions.

iii) Spoil heaps, cable laying, deer management plan
In our view, this proposal is likely to have a significant effect on the qualifying interests of the site. As a consequence, the Scottish Government is required to carry out an appropriate assessment in view of the site's conservation objectives for its qualifying interests. However, if the proposal is amended so that the works are done strictly in accordance with the following conditions, this significant effect can be avoided and an appropriate assessment will not be required:

- SNH to approve plans for the removal, storage and reuse of spoil heaps prior to construction;
- SNH to approve the Working Methods Statement for cable laying prior to construction;
- SNH to approve a competent Deer Management Plan prior to construction.

Spoil heaps: It is important that spoil heap material is not stored on, or where it might affect, SAC qualifying habitats. It should also not be stored in areas which might increase the risk of peat slide. Also, as indicted in the ES Addendum, the spoil heaps are likely to contain a mixture of peat and mineral soil. It is therefore important that they are not included in the Peat Management Plan as if it was all peat.

Cable laying: A tracked winch unit and cable plough will run along the cable route. As this will be after the spoil heap has been reduced in size, a bare peat running surface will be created and there are significant risks of instability. This should be addressed in the Working Methods Statement to avoid the potential for significant effects on the SAC habitats.

Deer: Deer are likely to disperse due to the removal of coniferous forestry and away from construction activity. They are likely to move onto and graze habitats within the SAC which they have access to. There is potential for increased grazing pressures on the SAC.

The deer management plan should comply with current Wild Deer Best Practice Standards and be agreed in writing with the planning authority in consultation with us well in advance of construction commencing. The plan should thereafter be implemented.

Since the proposed development raises natural heritage issues of national interest, **we object to the proposal unless it is made subject to these conditions.**

iv Track widening and Upgrade
In our view, this proposal is likely to have a significant effect on the qualifying interests of the site. As a consequence, Scottish Government is required to carry out an appropriate assessment in view of the site's conservation objectives for its qualifying interests. To help you do this we would further advise that, in our view, based on the information provided, the proposal will not adversely affect the integrity of the site.

The appraisal we carried out considered the impact of the proposals on the following factors: there will be no direct loss of qualifying habitat but there may be indirect impacts, amounting to loss of condition, affecting 1.6 to 2.9ha. The loss of condition of qualifying habitat is considered to be a significant effect. However these habitats, which are immediately adjacent to the track, have been affected by altered conditions such as drying out. We consider that the conservation objectives can be maintained and conclude there will not be an adverse effect on integrity of the site.

You may wish to carry out further appraisal before completing the appropriate assessment.

Detailed comments on peatland habitats are attached in Annex 2.

b Otter
Otter use the development site and larger water bodies are important for foraging and movement. Otter could be at risk from disturbance from construction activities and loss of habitats a result of pollution of watercourses from increased sediment load or from peat slide. However, as explained in the habitats section, it cannot be demonstrated that the Caithness and Sutherland Peatlands SAC is not at risk of loss or damage resulting from a peat slide triggered by the construction and/or operation of the wind farm. We cannot be certain that the operation is unlikely to have a significant effect on the habitats used by otter, and therefore **object to the proposal**.

Our objection can be removed if it is demonstrated that the SAC is not at risk of loss or damage resulting from a peat slide triggered by the construction and/or operation of the wind farm and the assessment is presented in a manner which is sufficiently transparent to enable us to verify its conclusions.

3.3 European Protected Species (EPS)
Wildcat
The Addendum confirms that no signs of wildcat have been found. However, their presence cannot be ruled out as areas of potentially suitable habitat were found during 2012 surveys. It is therefore possible that during the operational life of the wind farm that wildcats could be present, although it is unlikely that the long term status of wildcat in the area will be affected by this development.

Our advice regarding wildcat remains the same as our response of 25 September 2007. We **recommend** that appropriate mitigation measures, as identified in section 10.7.1 of the 2007 ES and A10.6 of the Addendum, should be implemented to protect wildcats and their resting places from disturbance during the construction, operational and decommissioning phases of the development.

3.4 Habitats Directive - Annex 2 Species
Atlantic salmon and freshwater pearl mussel
Excessive concentrations of suspended solids or contaminants entering watercourses, as a result of the construction works or peat slide, could affect Atlantic salmon and freshwater pearl mussel.

However, as explained in the habitats section, it cannot be demonstrated that the Caithness and Sutherland Peatlands SAC is not at risk of loss or damage resulting from a peat slide triggered by the construction and/or operation of the wind farm. We advise that additional information be provided as recommended in section 3.2a above.

3.5 Protected mammals (non-EPS)
Pine marten are found on the site. The species is listed on Schedule 5 of the Wildlife and Countryside Act 1981. We **recommend** that measures are secured to minimise risk of any

significant impact on this species. These measures should include those identified in section 10.7 of the 2007 ES and A10.6 of the Addendum.
Water voles are protected under Section 9 (4) of the Wildlife and Countryside Act 1981. We **recommend** that a precautionary approach should be adopted and measures secured to minimise the risk of any significant impact on the species. These measures should include those identified in section 10.7 of the 2007 ES and A10.6 of the Addendum.

3.6 Landscape and Visual Impact

a. Kyle of Tongue National Scenic Area (NSA)

Our advice regarding the Kyle of Tongue NSA remains the same as our response of 2 October 2007.

b. Landscape Character

Although there will be substantial impacts on the landscape character of the development site and some neighbouring Landscape Character Types, we consider the proposal to be within the capacity of the landscape in which it is located.

c. Special Landscape Areas

Significant impacts on the Bens Griam and Loch nan Clar Special Landscape Area (SLA) have been identified. However, we consider that the integrity of the SLA and its special qualities will not be affected. Considering the significance of impacts assessed from the Griam summits, design modifications would be desirable.

We **recommend** the removal of turbines 35, 36, 41 and 39, which appear as an outlying group from the summit of Ben Griam Beg. This would reduce the apparent extent of the development from key viewpoints in the Bens Griam and Loch nan Clar SLA. Removal of these turbines will also reduce the apparent extent of the wind farm from locations along the A836 road, such as VPs 3 and 9.

d. Wild Land

The proposal is not considered to produce significant adverse impacts on Search Areas for Wild Land (SAWLs). Our advice regarding wild land remains the same as our response of 2 October 2007.

e. Visual Impacts

We agree with the visual assessment that there will be substantial adverse and therefore significant visual impacts from Ben Griam Beg. There are likely to be similar significant impacts on Ben Griam Mor. The wind farm will form a dominant new feature within the view from these locations, albeit occupying one part of a 360-degree panoramic view. Considering the significance of impacts assessed from the Griam summits, design modifications would be desirable as detailed in our advice on Special Landscape Areas above.

We note that the proposal includes the use of external transformers, which will be located beside turbine towers. We **recommend** that transformers be housed within turbine towers, in order to reduce the overall visual impact of the proposal.

f. Cumulative Impacts

Cumulative impacts arise in conjunction with adjacent proposed and consented wind farms (Strathy Wood and Strathy North, respectively). Strathy South, in combination with Strathy North and Strathy Wood, significantly extends the presence of turbines in views from the summit and slopes within the Bens Griam and Loch nan Clar SLA. From the Griams it is the addition of Strathy South in isolation that causes the most significant impacts, rather than the cumulative impacts with Strathy North. The turbines of Strathy North are partially visually enveloped by, and subsumed into, the larger Strathy South wind farm. In other areas, sequential impacts on routes, particularly the A836, are also likely to be extended by the

proposal. These cumulative impacts are broadly reflected by the LVIAs finding, which predicts that significant impacts would occur at CVP1, Ben Griam Beg, and CVP2, A836 near Borgie.

The cumulative ZTV of North and South Strathy identifies that areas of potential additional visibility of the Strathy South turbines are relatively limited. However, the cumulative impact of the development in conjunction with Strathy North and Strathy Wood result in what will be seen as a single large wind farm of considerable extent, particularly along its north-south axis. The variation in turbine height between Strathy South and the consented Strathy North wind farms has the potential to produce adverse impacts arising from visual conflict. However, we do not consider that the variation in actual or apparent scale is such that significant adverse impacts will arise.

Whilst the Strathy South turbines in conjunction with Strathy North contribute to an increased visual presence of turbines in the landscape we do not consider that they would significantly impact upon the wider appreciation of the Caithness and Sutherland seaboard and hinterland moorland and mountains. **However, if Strathy South is consented, in combination with Strathy North and Strathy Wood, this will have a significant influence on the future capacity of the northern seaboard to accommodate further wind energy development.**

3.8 Recreation and tourism
Our advice regarding recreation and tourism remains the same as our response of 25 September 2007.

3.9 Decommissioning
Should the wind farm be granted consent, we strongly recommend that an additional consultation is carried out well in advance (e.g. 3-5 years) of the year of decommissioning to ensure all natural heritage considerations are taken into account. Our advice is that further survey work may be required in the year or more prior to decommissioning to fully assess the likely impacts, particularly on legally protected species and the adjoining protected areas.

4. Concluding comments
We have met recently with the applicant to discuss our request for further information and to discuss ecological issues identified in this response. We will continue to try and resolve these issues with the applicant where possible.

Please let Alexander Macdonald (Alexander.Macdonald@snh.gov.uk) know if you need further information or advice from us in relation to this proposal. I would be grateful if you could let us know of your decision in due course or of any further changes to the proposal which would be relevant to our interests.

Yours sincerely,

David Mackay
Operations Manager
Northern Isles and North Highland

Annex 1 – Bird Species – Further advice and detailed comments

Red-throated diver
Lochans in the immediate vicinity of the proposal are regularly used by nesting red-throated divers: six sites within 1 km of the site boundary were used at least once during five years of surveys (2003-2012), with another site within 2 km. In addition, two sites (lochans 54 and 64) were located within the site boundary itself. These last sites are especially vulnerable to wind farm impacts, including collision mortality and displacement. Lochan 64 may be the most at risk due to its proximity to turbines and because birds accessing the site may need to navigate several turbines.

Site 64 is treated in the Addendum as an atypical site, but whether it's atypical or not is less relevant than its record of occupation. A bird or birds were present on three out of four of the years during which surveys were carried out since 2003; yet Fig A11.1.42 records the site as being occupied only one year in five. We consider that the Addendum under-estimates the importance of site 64. Red-throated divers in the Caithness and Sutherland Peatlands often utilise alternative nesting lochans in different years. Given the small separation distance to the SPA boundary it is likely that lochan 64 is such an alternative site for divers that nest, in other years, within the SPA boundary.

There are difficulties with the flight activity records, particularly for the vantage points most important for site 64 (VP numbers 11 and 25). It is unclear just how many hours of vantage point work were carried out, due to a lack of clarity, and apparent discrepancies, between various tables (A11.1.57 - A11.1.60; A11.1.63). The total VP effort falls short of SNH's standard recommendations for such fieldwork. The number of days on which fieldwork was carried out, particularly regarding the periods of high diver activity around dawn and dusk, were too small to be representative. Of particular concern here is the extension of VP watches well beyond three hours to achieve more VP hours at the expense of number of days sampled: there were two watches in 2010 from VP 11 of apparently seven hours duration each. VP 11 has a very restricted viewshed (even plotted at 20m elevation) of the zone of likely diver flight activity, possibly leading to flights quite close to the lochan being under-recorded.

We cannot verify the predicted collision rates at other lochans where the VP work is adequate because of general complexity affecting all of the collision risk calculations. A worked example for this species is required to demonstrate the method of working and to allow us to check the quoted collision rates.

Taken together, these limitations mean that we cannot be confident in the overall collision mortality estimate for red-throated diver presented in the Addendum. However, there is a real possibility that it has been under-estimated to a significant degree.

The Addendum refers to Burgar Hill in Orkney as a site which has never killed red-throated divers and where divers nest successfully in close proximity to turbines, but the evidence from Burgar Hill is of limited relevance to Strathy South. There would be more turbines at Strathy, and of much larger dimensions than the Burgar Hill machines. There is evidence that the number of nesting attempts at Lowrie's Water (adjacent to the Burgar Hill wind farm) has declined since turbine installation. With respect to collision mortality, it would be more accurate to say that no corpses have ever been found rather than that no deaths have ever occurred; these two statements are not equivalent.

Proposed mitigation for this species at Strathy South includes multiple measures, but there are two important ones that are problematic:

- The proposal to make lochan 64 unattractive to divers through the placement of floats and similar structures. We do not consider this to be an appropriate measure for birds that may nest within the SPA in some years;

- The provision of diver nesting rafts elsewhere, outwith the development site. While rafts can be an effective measure for divers under conditions of elevated predation or disturbance, or changing water levels, there is little evidence that these are important factors in limiting the population of red-throated divers in this SPA.

It is possible that turbine removal could reduce disturbance and/or collision risk to divers at lochan 64, but the turbines affected cannot be specified without more robust data on preferred flight lines of divers using this site.

Hen Harrier
A single pair was confirmed as breeding close to the centre of the Strathy South site in 2010, 2011 and 2012. Confirmed breeding also occurred at a different site very close to the southern boundary of the development site in 2003, and there was possible breeding at another location in 2007. These territories should be regarded as 'SPA-associated' because although they are outwith the SPA, areas of SPA moorland are within the foraging range of hen harriers recognised in SNH guidance. Some of the flight line maps presented suggests that the 'tongue' of SPA land that stretches North-South through the centre of the development site is regularly used by foraging harriers.

Considerable harrier flight activity across most of the site was recorded in years when appropriate vantage point work was carried out. The flight line maps suggest that this flight activity was accounted for both by the Strathy South pair, and by pairs nesting on surrounding SPA land. Most flights were in height band 'B', which equates approximately to the range of heights at which birds would be at risk of collision. Unfortunately we cannot verify the collision rates from the information presented. It is important that we receive reassurance on this, because we consider that the number of flights recorded, together with their height distribution, would normally give rise to a level of predicted mortality well above the figures set out in the Addendum.

Technical Appendix A11.2 presents a range of information on habitats and prey availability that suggests Strathy South is, at present, attractive to nesting and foraging harriers. The development site may be used preferentially by harriers, compared with the existing SPA moorland (p.55), suggesting that the development site may help support the SPA population by affording optimal nest sites and perhaps increased productivity. However, one aspiration of the draft habitat management plan (HMP) is to manage some areas of the wind farm - mainly, those areas around the turbines themselves - so as to be unattractive to nesting and foraging raptors. This may not be an appropriate measure for a site so closely linked to a harrier SPA and which is clearly important, at present, both for harrier nesting and for foraging. The desired HMP outcomes (restored, active peatland and reduced-height vegetation around the turbines) may be difficult to implement across such a large area. The Addendum does not attempt to quantify harrier usage of the site post-construction.

Given that almost the entire wind farm site is currently used by foraging harriers (Fig A11.1.81), it is difficult to recommend turbines for removal that would significantly reduce the loss of foraging extent. However, some limited benefit might be gained by removing the turbines within 2km of the present nest site, in order to protect the approximate core range of this territory.

The Addendum presents a range of information to suggest that hen harriers are not very susceptible to disturbance or collision impacts. However, the range of evidence currently available - including findings from the wind farms at Paul's Hill, Smola and Griffin - is limited in both geographic scope and in the time-spread of records. The findings from these other sites are somewhat inconclusive and, at times, contradictory. From the information presented in the Addendum and from other sites, we cannot be confident that the pair of harriers nesting within the development site would continue to do so after forest clearance, wind farm construction, and subsequent habitat management.

Greenshank

The assessment of collision risk for greenshank is set out in Technical Appendix 11.3, with the specific purpose of calculating collision risk probabilities using distance detection corrections. This is the same approach taken for whimbrel collision risk calculation for the Viking wind farm.

The method calculates a distance detection function based on a Generalized Linear Mixed Model (GLMM) to correct for bird flight activity not seen from vantage point watches. This approach has much to commend it as species such as breeding waders are much harder to detect, even when flying, as distance increases. The SNH collision risk methodology assumes that bird flight activity seen with ~2km of a vantage point reflects actual activity. This assumption probably holds true for large species such as geese and divers, but this is unlikely for breeding waders.

A comparison with whimbrel is appropriate. Both species are cryptically coloured, more or less the same size[1] and equally vocal in flight. Dedicated observations of whimbrel conducted for the Viking wind farm showed that flight activity was significantly underestimated beyond 250m (Natural Research (Projects) Ltd., Viking ES Addendum Appendix A11.2: Estimation of Flight Activity). Critically it was assumed that only within the initial 250m were all flights detected. In the next distance band on 44% of flights were detected.

The implication of this is that the distance correction for greenshank which uses the 0-500m band as the reference value for flight activity is likely to be an underestimate. This means that the corrected flight activity values will still underestimate collision probability by an unknown amount.

Observations from RPS at Achany show that greenshank appear not to show any great avoidance of turbines which further suggests that collision risk is likely to be more of a potential issue than disturbance and displacement. A significant proportion of greenshank flights are situated within the turbine risk height band, which will exacerbate collision risk.

We cannot therefore conclude that predicted collision values for greenshank at Strathy South are accurate (within the constraints of collision risk modelling) and therefore, on a precautionary basis, given that greenshank densities here are high, we cannot safely conclude that there will not be an adverse effect on site integrity for greenshank within this SPA.

The applicant may wish to consider further work on collision rates. This may produce a more robust distance correction function, which will return collision probabilities that better reflect problems of detecting greenshank flights. This would require further field work, targeted at greenshank breeding pairs during appropriate time periods (especially during mating, egg laying and possibly brood defence).

The alternative is to maintain a buffer around greenshank territories within which turbines are not sited. The size of such a buffer can be estimated by using an empirical basis for determining territory size. Hancock *et al.* (1997)[2] estimate a territory radius of 800m (Figure 3, Appendix to paper) based on 491 observed sightings of birds. If this figure is used then turbine locations within 800m of greenshank territory centres will be the principal turbines that pose a collision risk to breeding greenshank.

[1] In fact greenshank are slightly smaller than whimbrel with a body length of about 30-34cm compared to 40-46cm for whimbrel (Handbook of Bird Identification for Europe & the Western Palearctic, Beaman et al. 1998).

[2] M.H. Hancock, D.W. Gibbons & P.S. Thompson (1997) The status of breeding Greenshank Tringa nebulara in the United Kingdom in 1995, Bird Study, 44, 290-302.

The effects on breeding greenshank could therefore be mitigated by removal of turbines within 800m of territory centres.

Black-throated diver
There is an estimated 26 pairs of black-throated divers in the SPA. Loch 31, within the SPA, is used consistently by nesting black-throated divers. The adjacent loch 54 (within the development site boundary), while apparently not used as a breeding site, does appear to be used by the loch 31 birds for other behaviours, given the frequency of flights between the two waterbodies. Other black-throated divers, breeding and non-breeding, may use loch 54 as well.

While numerous flights occurred to the west of the development site (mainly associated with loch 31), there were very few flights over the wind farm envelope itself.

The lack of specific evidence to inform an assessment of wind farm disturbance on this species, together with its scarcity in Scotland, suggests that a precautionary approach to assessment is appropriate. At present it cannot be ruled out that displacement and permanent loss of one breeding pair from the SPA would occur.

The effects on black-throated diver could be mitigated by removal of turbines 55, 62, 63, 68, 73 and 74.

Wood sandpiper
The SPA population is estimated to be about six breeding pairs. The population around Strathy South is therefore significant in terms of its size. Survey information suggests two breeding locations for this rare species within 1km of the Strathy South wind farm. An additional site recorded by RSPB at Skelpick Burn does not appear in RPS surveys though eggs have been recorded at this location. It is very likely that birds regularly breed at Yellow Bog situated within the two 'arms' or "U" of the Strathy South wind farm.

There is no evidence on whether wood sandpiper are displaced or disturbed by wind farms. An assessment of disturbance distances (Ruddock & Whitfield, 2007)[3] suggests that birds may be disturbed over a range of 150-300m, though the evidence for this is meagre.

One pair of wood sandpiper (located on Yellow Bog) is close to, and may lie within 300m of, at least one turbine (turbine 51). Given the uncertainty over wood sandpiper disturbance and displacement effects, we cannot conclude that this breeding pair will not be displaced by a turbine at this location.

There is no evidence to indicate whether wood sandpipers are liable to collide with turbines. Nor is there any good evidence on display or alarm calling flight heights. Given the presence of a single pair within about 300m of one turbine we cannot conclude that collision will not happen. The loss or displacement of one pair is significant in terms of the SPA and UK breeding population of this species.

On the basis of information available, we advise that the proposed wind farm may displace (or disturb) one pair of breeding wood sandpiper. We also advise that the proposed wind farm may lead to the loss, through collision, of one pair of breeding wood sandpiper that could adversely affect the population of the species as a component of the SPA.

The effects on breeding wood sandpiper could be mitigated by removal of turbine 51.

[3] M. Ruddock & D.P. Whitfield (2007) A Review of Disturbance Distances in Selected Bird Species. Report to SNH

Golden eagle
We have previously recommended that PAT (Predicting Aquila Territories) modelling should be carried out for the Strathy South proposal. No modelling has been presented as part of the Addendum.

However, the number and distribution of flight line maps suggests that eagle pairs adjacent to Strathy South make only limited use of it for foraging. This is in line with current land use, and indicates that the additional loss of foraging extent post-construction would not be significant.

One eagle nest site is located c.2.5km south of the Strathy South site boundary. Forestry clearance and wind farm construction are considerably more disruptive than most other activities that can cause eagle disturbance. The location of the eyrie with respect to the wind farm suggests that it may be particularly vulnerable.

On a precautionary basis, we advise that the effects on golden eagle could be mitigated if there is no forest removal or wind farm construction operations within 3.5km of the nest site during the period February to August inclusive.

The developer may wish to carry out further work to investigate the line of sight from this eyrie and it is possible that the 3.5km buffer may be amended with suitable supporting evidence.

Annex 2 – Peatland Habitats - Detailed comments

A14 Soil and Water

Page A14-14, Table A14.9 Changes to Summary & Conclusions (inc Residual Impacts)
We advise that the mitigation measures described should be incorporated into the agreed Construction Environmental Management Plan (CEMP).

Technical Appendix A4.1 Construction Environmental Management Plan (CEMP)

Page 13, Section 7.7 Access Track Drainage
Paragraph 7.7.12 The check dams described, while acceptable in areas of mineral soil, will be less appropriate in areas of peat where they could promote erosion. Alternative methods should be considered and described.

Pages 49 & 50, Section 24 Access Track Construction
As with Section 7.7 Access Track Drainage, there is no reference to the possibility that floating road construction will be employed and all the activities and description relate to excavated tracks only. This is contrary to several references to the use of floating tracks elsewhere in the ES Addendum. We advise that the CEMP should address all methods of track (and other) construction.

Technical Appendix A4.3 Peat Management Plan

Page 8, Table 4.1 Peat excavation for cut and floated track
The length of cut track is given as 25716.43m. According to the relevant footnote, this includes "upgrades to existing track". However, the Volume of peat excavated is calculated by multiplying the New Track width (7.0m) by the Depth of excavation (0.65m) by the Length of cut track (25716.43m). The resulting figure, 25716.43m^3 must be a significant over-estimation, as from Chapter 4 Development Description, Section A4.2.3 Tracks it is clear that just over 50% of the cut tack is upgraded existing track which will not generate as much peat as newly cut track. Given that the peat balance is already calculated to give a 10,000 m^3 shortfall (i.e.10,000 m^3 less excavated than required for reinstatement), or an exact balance according to the version in Annex A, this suggests a much more significant shortfall which should be addressed in the final version of the Peat Management Plan.

Technical Appendix A 14.1 Peat Landslide and Hazard Risk Assessment

We request clarification on the following points:

Page 16, Section 4.2 Methodology
"Over 2400 peat probes have been carried out within the application site".
We note that only 1465 probe locations are described in Annex A. Thus although 2462 peat probes may have been carried out (per Table 5-1), it is not clear whether all of these, or only the 1465 described in Annex A actually contributed to the analysis.

Page 18, Section 5.1 Peat
Table 5-1 gives four categories of peat depth, the related Drawing 5 eight categories. This would be acceptable except that the categories do not have a simple relationship. Table 5 has a category 1.5 – 3.0m. However the nearest equivalents in Drawing 5 are 1.5 – 2, 2 – 2.5 and 2.5 – 3.5. A revised Drawing, or Table, presenting the information in a consistent manner would be helpful.

Page 23, Section 6.1.1 Slope Gradients
"…it is evident from the Slope Plan that the majority of the tracks and turbines are on areas with flatter gradients (<4^o)". The Slope Plan (Drawing 4) does not illustrate slopes <4^o, so it is not evident that the majority of the tracks and turbines are on areas with gradients <4^o. The slope

categories in Table 6-1 Coefficients for Slope Gradients are different again from those on Drawing 4.

Pages 25 – 29, Section 6.1 Risk Rating and Table 6.5 Stability Risk Rating for each Turbine. Although it is stated that the Substrate Conditions (Table 6.3 and Drawing 6) are included in the derivation of the Risk Rating, it is not clear from Table 6.5 whether this has been done. The absence of reference to Substrate would suggest that it has not.

Pages 27 – 29, Table 6.5 Stability Risk Rating for each Turbine
We note that Turbines 33 and 52 are proposed for areas of peat >3m deep. From Drawing 8 Peat Probing Locations there would appear to be scope to site these in areas of shallower peat.

Page 33, Section 6.4 Results
1st Paragraph. "The stability risk assessment has demonstrated that the majority of the Strathy South site lies within an area of negligible to low risk with regards to stability based on Drawing No.7. Those areas that have been identified as being at Medium risk of instability have been considered in a hazard impact assessment".

It is not clear why this approach has been taken. Firstly, it is not clear whether the Coefficients of Substrate were included in Figure 7 (It is assumed from Annex A that it is, but Table 6-5 puts this in some doubt). Also a Low risk of instability combined with an Extremely High Impact Rating would give a Hazard Ranking of 10, which (Table 6-11) is 'Significant' and close to 'Substantial'. It may be that this scenario does not exist.

We are unclear why no Table for Impact Rating comparable to that in Annex A Risk Rating is presented. This seems to be a significant omission as it precludes independent assessment of the data and analysis.

2nd Paragraph. "The tributaries and the River Strathy are designated as a special Area of Conservation (SAC)…" We advise that this is incorrect, but all the surrounding peatland is part of the Caithness & Sutherland Peatlands SAC.

Page 34, Section 6.4 Results
"Of the medium risk probe locations, 6 areas were considered to have either a potential impact on the wind farm infrastructure or could have an impact on local watercourses. These areas are shown on Drawing No.7 and listed in Table 6.12…".

Of the six locations listed in Table 6.12, one has a Risk Rating of "Low", but the 'upgrade' to 'Medium' is explained. Another location has a Risk Rating of "High" with no explanation, so it is unclear whether a 'Medium' location has been omitted or whether it is meant to be five 'Medium' and one 'High' location.

We are unclear how the filtering which identified these locations was undertaken. The methodology is not transparent and, as a result we are unable to verify.

Page 37, Section 7.1.1 Specific Locations
"All of the turbine locations were identified as either negligible or low risk resulting in an insignificant hazard assessment. However it is proposed that turbine T47 may benefit from the flexibility to microsite…to avoid or minimize the need for excavations in sloping ground and thick peat which would increase the risk of construction induced instability".

Table 6.5 'Stability Risk Rating for each Turbine' comments in relation to T47 "Thin peat on flat site, position acceptable".

We are unclear whether the comment in Section 7.1.1 relates to another turbine, or whether the comment in Table 6.5 is inaccurate.

Page 38, Section 7.2 Access Tracks
4th bullet. “Upslope drainage ditches to the track will be required onside-long ground…” We accept the need for these, but advise that their purpose should be to divert surface flow from the track, not to lower the water table and that they should be designed and constructed accordingly.

Page 40, Section 8.1 Conclusions
“The entire site can be considered to be extensively covered in peat with a maximum recorded thickness of 5.0m on the flatter areas. The locally thicker areas of peat have been avoided through layout design”. We consider that this statement is not entirely consistent with, for example, Turbines 33 and 52 being proposed for areas of peat >3m deep. We would welcome further effort to avoid areas of deep peat.

Page 41, Section 8.2.2 Turbines
2nd Paragraph. “The preferred foundation solution for areas of thick peat would be a gravity pad foundation bearing on a sound stratum…. consideration should be given to constructing a rock retaining bund (rock doughnut) prior to excavation of the peat or alternatively micrositing to reduce peat thickness”.

Although not explicit in the above, there is an implication that where there are side slope stability concerns, a rock retaining bund is the first option and micrositing to thinner peat a subsequent option. We recommend (and this would be consistent with stated objectives elsewhere in the ES Addendum) that these should be reversed, i.e. the first presumption should be to microsite to shallow peat and only if that is not possible should there be construction in deeper peat, which may or may not require rock retaining bunds.

Page 41, Section 8.2.3 Access Track
Final bullet, final sub-bullet. “The top of cut slopes should be provided with a small bund to retain the peat to prevent desiccation and maintain the local stability of the peat. We cannot envisage what is meant by this and reference to Figure A4.6 Typical Access Tracks does not help.”

Page 42, Section 8.3 Further Work
We welcome the commitment to more detailed ground investigations and the incorporation of the resulting designs etc. into the Construction Method Statement.

Annex 3 – Compilation of recommended conditions and measures

We recommend the following as conditions to avoid a significant effect on the Caithness and Sutherland Peatlands SPA and SAC:

- Removal of turbines within 800m of greenshank territories to mitigate effects on breeding greenshank.

- Removal of turbines 55, 62, 63, 68, 73 and 74 to mitigate effects on breeding black-throated diver.

- Removal of turbine 51 to mitigate effects on breeding wood sandpiper.

- No forest removal or wind farm construction operations within 3.5km of eagle nest site during the period February to August inclusive to mitigate for breeding golden eagle.

- SNH to approve plans for the removal, storage and reuse of spoil heaps prior to construction.

- SNH to approve Working Methods Statement for cable laying prior to construction.

- A competent deer management plan that complies with current Wild Deer Best Practice Standards and be agreed in writing with the planning authority in consultation with SNH well in advance of construction commencing. The plan should thereafter be implemented.

We recommend the following measures to further reduce impacts on the natural heritage:

- Appropriate mitigation measures as identified in the 2007 ES and 2013 Addendum be implemented to protect wildcats and their resting places from disturbance during construction, operational and decommissioning phases of the development.

- We recommend that appropriate mitigation measures as identified in the 2007 ES and 2013 Addendum be implemented to minimise risk of significant impact on pine marten and water vole.

- We recommend removal of turbines 35, 36, 41 and 39 to reduce impacts on the Ben Griam and Loch nan Clar Special Landscape Area.

- We recommend that transformers be housed within turbine towers to reduce the overall visual impact of the proposal.

- With reference to the Land Reform (Scotland) Act 2003, where access requires to be restricted at any time, clear signage following the Scottish Outdoor Access Code branding guidelines should be used.

- We recommend that a decommissioning plan is produced and an additional consultation is carried out well in advance (e.g. 3-5 years) of the year of decommissioning to ensure all natural heritage considerations are taken into account.

RPS

Our Ref: SEC7232/SZ

E-mail: **zismans@rpsgroup.com**
Tel No: **0131 555 5011**
Date: **24 December 2013**

Alec McDonald
Scottish Natural Heritage
The Links, Golspie Business Park
Golspie, Sutherland
KW10 6UB

Dear Alec,

CLARIFICATIONS REQUESTED IN SCOTTISH NATURAL HERITAGE'S 20TH NOVEMBER 2013 RESPONSE TO STRATHY SOUTH WIND FARM ADDENDUM

This letter provides the clarifications and associated up-dates requested by Scottish Natural Heritage (SNH) for the proposed Strathy South Wind Farm, following SSER's submission of the Environmental Statement's Addendum in July 2013. The requests were made by SNH in its letter to the Energy Consents and Deployment Unit (dated 20th November 2013) and were also the subject of discussions with SSER and their ornithology consultants (RPS) during a meeting on 7th November. Following this meeting, and prior to SNH's response, we had also provided clarifications and up-dates by email (dated 13th November 2013).

The structure of this letter reflects the topics SNH have requested clarifications on, specifically;

1. Ornithology

2. Habitats, Protected Species and Peatland; and

3. Landscape, Visual Impact, Recreation and Tourism.

The information provided relates to the 2013 Modified Layout with possible deletion of up to eight of the 47 turbines, and therefore considers a reduced 39 WTG layout (comprising turbine deletions requested by SNH and T76 for Ministry of Defence). SSER is considering this reduction and will proceed providing remaining concerns identified by SNH can be resolved. We believe these matters can be addressed and therefore would like to take this opportunity to emphasize SSER's willingness to meet at SNH's earliest convenience during January, to deal with any remaining issues SNH may have. You will be aware The Highland Council are keen that this Project meets the March 2014 planning committee date and therefore we would request that this meeting take place before the end of January. You kindly agreed when we met on 7th November to identify a slot in January when advisors would be able to review the clarification information provided, and we trust that this has been arranged. We remain most grateful for the time and assistance SNH staff have and continue to provide on Strathy South.

1. Ornithology

As requested, we have provided worked examples of the Collision Risk Model (CRM) method for both red-throated diver and hen harrier (see Appendix 1). We have also up-dated the modelling for greenshank (see Appendix 2), based on the revised distance-detection approach requested. Up-dates have also been provided on black-throated diver, wood sandpiper and golden eagle.

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Red-throated divers

SNH raised a number of clarification requests and points in relation to this species and we are therefore pleased to respond with the information below.

Firstly, Appendix 1 provides clarification of the collision risk modelling process and a worked example of the CRM for red-throated diver. This uses the 39 turbine layout to reflect the potential deletion of turbines 55, 62, 63, 68, 73, 74 and 51 (requested by SNH for black-throated diver or, in the case of turbine 51, for wood sandpiper), together with deletion of turbine 76 (requested by the Ministry of Defence).

The resulting 39 turbine layout gives:-

- a 56.8% decrease in the predicted collision risk for red-throated divers, dropping from a predicted 4.75 birds over the 25 year lifetime of the 47 turbine layout, to 2.70 birds (an equivalent of one bird every 9.26 years compared to one bird every 5.26 years).

- Any risk of displacement from Loch 54 would also be greatly reduced, as the distance from its shoreline to the nearest turbine would increase from 296m to 1,048m (Turbine 52) (a 354% increase).

The deletion of these eight turbines, if undertaken, would therefore significantly lower the risk of any potential effects on red-throated diver, by reducing the scope for collision and for disturbance.

We now address the points made in relation to species' use of Loch ID 64. Firstly, we wish to highlight that the Addendum already makes it clear that birds using this lochan are SPA-associated birds. Secondly, Figure A11.1.42 does not show the loch was 'occupied only one year in five' as SNH suggest, but shows that probable or confirmed breeding was recorded once out of five years. Thirdly, the fact that flight patterns associated from this lochan in 2012 was atypical is also clear in our view, being the only year in which north/south flight activity was evident from Loch 64.

In relation to VP effort, it should be noted that no watches of seven hours were carried out, and that as explained at our meeting and by email, these would have been two three hour watches, divided by a one hour break, in accordance with standard practice.

We also wish to clarify that diver VP 25 was not set up to cover activity at Loch ID 64. It was established in early May 2012 to cover Loch ID 54, prompted by early observations of red-throated diver at Loch ID 54 (during breeding diver surveys). As on-going breeding diver surveys failed to identify any further breeding activity that season at this location, this VP was suspended in June 2012. Diver VP 25 is therefore not of particular importance, especially as monitoring of the area continued throughout 2012 from other VP locations. The viewshed restrictions of VP 11 were identified at the time, and after initial observations, its use was suspended and survey effort re-allocated to other VPs that covered the area.

In relation to SNH's comments on two elements of potential mitigation, we do note firstly that SNH do not consider diverting divers from Lochan 64 as an appropriate mitigation option. We appreciate this is an unconventional mitigation measure, but nonetheless believe it could be a potentially useful management tool to further reduce collision risk. Whilst we do appreciate it could be conceived as a rather negative measure, we consider this would be counter-balanced by the provision of diver rafts. As mentioned at our 7th November meeting, SSER propose to employ up to two seasonal conservation managers to cover Strathy North and South, and part of their responsibility would be to assist with SNH's initiative to prevent recreational disturbance to breeding divers.

In relation to diver rafts, we would welcome any research findings SNH have on the factors limiting red-throated divers in this SPA, and if SSER can support any conservation measures that will further assist the population, in addition to diver rafts, it would be pleased to consider possible assistance

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with these. We do however, wish to highlight the fact that we have not implied that elevated levels of predation or changing water levels are important factors limiting the SPA's diver population, but nonetheless we trust that diver raft provision does provide some potential additional protection from predation and disturbance in some situations.

Hen harrier

SNH raise a number of clarification requests and points in relation to this species and we are therefore pleased to respond with the necessary information. As requested, we have provided worked examples of the Collision Risk Model (CRM) method for hen harrier (please see Appendix 1).

We agree with SNH that the breeding hen harriers present are SPA-associated birds. This has already been fully taken into account in the Addendum.

To clarify the point raised on flight activity mapping and collision risk, the flight lines presented in the figures are colour-coded so that even if just one short (15 second) segment of a flight was within the mid flight band, the whole flight was shown at this potential collision height category. For collision risk modelling calculations, however, in accordance with standard methods, only the seconds at potential collision risk are included in calculations. This is explained in the text but will account for the difference in impression of 'at risk' flight activity in the flight maps compared to the results from predicted collision modelling. We trust this helps clarify this matter, in tandem with the further details on collision risk modelling.

In response to SNH's point on habitat management, we respectfully draw your attention to the fact that the proposed sward management follows what SNH have already approved for the Strathy North windfarm (including approvals for the Detailed Strathy North HMP given in 2013). In fact, the extent of proposed sward management at Strathy South is smaller than the area approved for Strathy North. SSER and RPS are therefore entirely confident the proposed management measures for Strathy South can be fully delivered, if the site is consented. Furthermore, if the eight turbines are removed, then the area of ground where sward management was potentially required would be reduced. In addition, as discussed at our meeting, in order to oversee habitat management if Strathy South is consented, SSER propose to employ up to two suitably qualified and experienced habitat managers who will be responsible for delivery of all habitat mitigation works on site, including sward monitoring and management, drain blocking, and installation, monitoring and maintenance of diver rafts,

In addition to these practical considerations, the extent of turbine-free habitat for restoration within Strathy South would also be significantly increased (notably in the northwest part of the site) if the eight turbines are deleted. This extends the habitat provision that had already been made in the 47 turbine layout.

One further HMP element we can also now highlight is that approximately 1,000ha of additional off-site peatland management has been secured on Armadale Farm, within the Caithness and Sutherland SPA. This work involves a combination of grazing management (initially for five years) and drain blocking (for 25 years) to improve peatland habitat across this area. This may or may not bring additional benefits to harriers, depending on the current and projected prey availability that will result, or any potential increase in nesting opportunities over time. Nonetheless, it is considered realistic that some additional foraging and nesting benefits are likely to accrue over time. Other additional measures, including offsite forest removal for approximately 180 ha, are also being considered at present, releasing further habitat through restoration.

In relation to SNH's points about harrier activity on site, the suitability of Strathy South, both for nesting and for foraging, will decline as the forest matures. It is important to note therefore that the previous patterns of nesting and foraging will not be characteristic over the next 25 years, and that they will inevitably decline. Compounding this, we also highlight that completion of grant-aided forest removal and peatland restoration at Strathy Wood being sought by SNH will reduce the artificially high concentration of nesting harriers in this area. This will further significantly reduce the potential for

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harrier activity by the time Strathy South becomes operational (if it is consented). Furthermore, whilst the Addendum does not seek to fully quantify harrier usage of the site once operational. the level of harrier activity on site will be lower than at present, taking these changes (and mitigation) into account. We do however, draw SNH's attention to the fact that the re-running of the collision risk model with the eight turbines deleted does (albeit artificially) lead to a 4% increase in predicted collision risk (due to changes in the windfarm polygon). In reality, however, there is likely to be no increase, or indeed a reduction in predicted mortality, below the one harrier every 9.09 years predicted for the 47 turbine layout.

We also disagree with SNH's implications that the conservation status of the SPA's harrier population should be allowed to be dependent on its breeding success or foraging use of non-SPA exotic (and highly damaging) conifer plantations. It is incumbent on SNH to ensure the conservation management of the SPA is such that it supports qualifying species in its own right. We note, for example, that according to Kenny Graham (pers. comm.), muirburn on SPA moorland was responsible for damaging traditional hen harrier (and merlin) nesting habitat near Strathy North. We believe therefore that SNH's highest priority should be facilitating conservation management on the SPA, by supporting landowners to implement measures that will benefit qualifying species and wider biodiversity.

Finally in relation to hen harriers, we do not agree that the risk of displacement of foraging or nesting is in line with what SNH intimate. On the contrary, the evidence from the UK, Ireland and elsewhere does on balance reflect continued nesting and foraging activity within, and in proximity to, operational windfarms. The long-term conservation of this species, with this SPA and the Natura network, is clearly related to eliminating illegal persecution, not wind farm development (by orders of magnitude), and SSER are willing to contribute to tackling this threat where possible, Whilst we appreciate that this may not be strictly relevant in terms of mitigating predicted effects at Strathy South, we would be pleased to discuss this wider conservation measure in more detail when we meet. We wish to make it very clear, however, that in relation to Strathy South, we do not accept the need for any turbine removal at all, to further mitigate the already low predicted effects on hen harrier foraging or nesting, given evidence on this species' interaction with windfarms, and the habitat management that will be put in place, if consent is granted.

Greenshank

The refinement to the General Linear Mixed Model that SNH requested has been completed, and the results are presented in Appendix 2. The difference in the adjusted predicted collision rate is negligible and therefore the conclusion of the ES Addendum's assessment remains valid. Even taking into account the implied doubling of predicted collision rates that SNH's response infers is desirable, the adjusted predicted mortality with the eight turbines deleted is equivalent to one collision every eight to 10 years.

Even assessing this against the original SPA qualifying population of 256 pairs (as opposed to Bellamy and Eaton's 2009 estimated population of 653 pairs (95% confidence limits 389-917), such a low level of mortality would clearly not contribute to an adverse impact on the SPA's integrity. Added to this fact, once benefits from forest removal and mitigation are taken into account (specifically the reduced mortality from predation by pine marten and corvids as a result of plantation removal, and the benefits of peatland restoration on and off site in terms of habitat), it is entirely feasible that the 2013 Modified Layout (with the eight turbines deleted) would give a net benefit for this species.

Black-throated divers

Whilst SSER and RPS agree that flight activity was to the west of the site, and that there were very few flights over the wind farm envelope itself, we do acknowledge that there is limited information on potential disturbance to this species from wind farm construction or operation. We do note however, that there are Scottish and wider examples of black-throated divers nesting in proximity to roads and other infrastructure, and the inference from these situations is that this species can continue to occupy lochs and breed successfully, despite traffic and other activities.

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Nonetheless, we note SNH's precautionary stance and its request to delete seven of the 47 turbines to mitigate disturbance risks arising from diver use of Loch nan Clach (Loch 54). SSER and RPS are also mindful of the risk reduction such deletions would bring to red-throated divers.

In light of these considerations therefore, SSER propose to delete turbines 55, 62, 63, 68, 73 and 74, subject to resolution of any remaining matters raised by SNH.

Wood sandpiper

As discussed, and as detailed in our discussions and 13th November email, additional information has been provided from RSPB and ourselves on wood sandpiper, specifically a nest record offsite at Skelpick Burn (NC757520) and further July 2010 wood sandpiper records, from Yellow Bog. As noted in our email, on 15th July 2010, a single bird was recorded twice, alarm calling from the bog pool system within Loch ID 97 (at NC 7940350687 and the 2nd at NC7926350674). On 22nd July, two records, also within the bog pool system at Loch ID97, were made. The first was an adult calling (at NC7932051019) that exhibited agitated behaviour as a teal flew past. The second observation (at NC7936851080) was of a short flight of an adult bird alarm calling.

SNH highlight in its response therefore, that despite the assessment of disturbance distances in Ruddock and Whitfield (2007) stating that wood sandpiper may be disturbed over a range of 150-300m (albeit 'on meagre evidence'), SNH cannot conclude that one breeding pair will not be displaced (disturbed) by turbine 51. They also note that given the lack of evidence to indicate whether wood sandpipers are liable to collide with turbines, the proposed windfarm may lead to the loss of one breeding pair from collision. Whilst we highlight that displacement and collision would be mutually exclusive (i.e. birds that are displaced would not subsequently be at risk of collision), SSER do note SNH's request to delete turbine 51 for this species. SSER therefore propose to delete turbine 51, subject to the resolution of any remaining matters raised by SNH.

Golden eagle

In regard to the 3.5km buffer from the breeding eagle eyrie, we highlight that disturbance distances for this species have been reviewed by SNH (Whitfield et al. 2008), leading to the definition of safe working distances to the nests of golden eagles of 1000-1500m. FCS Guidance Note 32: Forest Operations and Birds in Scottish Forests (November 2006) gives between 750 and 1500m. We therefore wish to highlight that a figure of 3.5km is excessively precautionary, and we do not consider it necessary to apply this buffer. Furthermore, SSER do not consider it necessary to investigate the line of sight from this territory's eyries, but nonetheless will do so, as a gesture of goodwill, as David Wood, the SNH ornithology advisor on this case, explained at our meeting that he has not been able to visit Strathy South prior to providing SNH colleagues with his ornithological advice..

Although not raised by SNH in its response, SSER and RPS would like to take the opportunity of this letter to respond on the additional golden eagle information from local ornithologist Paul Butterworth. This was of latterly communicated by RSPB to SNH and RPS (by email from Kenny Graham to Alexander Macdonald on 24th September 2013), reporting that according to this source, nesting took place at this location in 2009 (NC7552), with a single chick reared (and ringed). RSPB reported carrying out searches for a nest location in this area in 2013 (by RSPB staff and local raptor study group worker Ian MacPherson), and that this revealed no evidence of an eyrie.

SNH do not make any reference to this additional information in its 20th November letter, despite this information being provided to them on 24th September (by email) and subsequently by RSPB letter (dated 25th October). However, given the long run of vantage point and raptor survey data, SSER and RPS are confident that the baseline on eagle flight and breeding activity remains robust and that the conclusions in relation to this species remain entirely valid. To inform our own assessment, additional PAT modelling was commissioned, and this can be made available to SNH for clarification purposes, if required. We do also wish to highlight that if the eight turbines were deleted, the already low predicted collision risk (one collision every 71.4 years) drops to one in every 125 years, and notably,

there would be additional benefit to the Calf Rock (and any Skelpick) birds from the expansion of turbine-free restored habitat on the northwestern part of the site. Added to this, possible additional off-site locations being investigated for further forest removal that would bring benefits to golden eagles, covering approximately 100ha to the south. It therefore remains demonstrable that the proposed wind farm would not have any adverse affect on the SPA's golden eagle population. Once on and off-site enhancement measures are also taken into account, there may, in fact, be a net benefit for this species, compared to the baseline situation,

Summary in relation to birds

To briefly recap in light of the considerations above, SSER and RPS therefore wish to highlight the following in relation to SNH's response:-

We welcome SNH's conclusion that, if consented, the 2013 Modified Layout would not have a significant effect either directly or indirectly (including through adverse affects on population sizes) for golden plover, dunlin, merlin, short-eared owl, wigeon or common scoter;

In relation to golden eagle, we welcome SNH's conclusion that loss of foraging extent post-consent would not be significant. In addition, we emphasize that the proposed forest removal and wind farm construction would take place in excess of the upper limits of peer reviewed published disturbance prevention distances. Therefore, we do not consider it necessary to apply a February to August (inclusive) restriction on forest removal or wind farm construction within 3.5km of golden eagle nest sites. SNH have raised no other concerns in relation to golden eagle, and we therefore trust that there are no residual concerns in relation to this species. In addition, as highlighted above, once on and off-site enhancement measures are also taken into account SSER and RPS conclude there may be a net benefit for this species, compared baseline conditions,

In relation to greenshank, the requested clarification on adjusted collision risk has been completed and the difference in predicted mortality is negligible. With the further precautionary adjustment taken into account on top of this, as SNH request, the resulting predicted mortality of one death every eight to 10 years still remains well below what would risk an adverse affect on SPA integrity. Once benefits from forest removal and mitigation are taken into account (specifically reduced predation and increased habitat availability), it is considered likely that 2013 Modified Layout (with the eight turbines deleted) will in fact result in a net benefit for greenshank.
For wood sandpiper, turbine 51 would be deleted, as requested as a precaution, to mitigate collision or displacement risk to breeding birds.

For black-throated divers, the deletion of turbines 55, 62, 63, 68, 73 and 74 would mitigate the risk of displacement of this species, specifically breeding and non-breeding birds using Loch nan Clach. The deletion of these would also bring reduced displacement and collision risk to red-throated divers, Together with provision of diver rafts off-site, and reduced risk of predation from forest removal, it is considered that, if consented, there would be no adverse impact on the SPA for these species from the 2013 Modified Layout wind farm, with the eight turbines deleted. Finally, SSER also wish to highlight that the proposed Strathy conservation rangers would be available to assist SNH in its attempts to reduce recreational disturbance to breeding divers in the area,

It is therefore hoped that following the clarifications contained in this letter, it is possible resolve any outstanding ornithological matters.

2. Habitats, Protected Species and Peatland

The information provided below covers the points raised in SNH's 20th November response in relation to habitats, protected species and peatland. For ease of reference, where relevant, the letter's paragraph number is provided. The points raised within the body of the letter are covered initially, followed by the points SNH raise in the letter's Annex 2.

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3.2 Caithness and Sutherland Peatlands SAC

a. Blanket bog and wet heath habitats

i)Access track passing places

As requested, SSER is pleased to provide the location of the two passing places, enclosed in Appendix 3. We repeat the confirmation in the Addendum that these will not result in any direct loss of qualifying SAC habitat. We trust now that their location has been confirmed, SNH is able to remove its objection in this respect.

ii) Peat Landslide and Hazard Risk Assessment

As is standard practice for Section 36 applications, the Peat Slide Hazard Risk Assessment has been independently reviewed, and a site visit has been undertaken, by appropriately qualified external consultants acting on behalf of the Scottish Government. Whilst clarification of certain matters has been requested by these external consultants in relation to the PLHRA, it has been agreed that the site represents a predominantly low risk and that appropriate measures are in place to mitigate any risk. The design process has been focussed on minimising the disturbance and keeping the turbines away from slopes and thicker peat where possible. As a consequence this minimises risk and reduces potential peat slide risk. Whilst certain turbines are located relatively close to the Caithness and Sutherland Peatlands SAC, these have all been located on flat lying ground with either negligible or low risk of peat slide. Accordingly the report authors, SLR, conclude that the Caithness and Sutherland Peatlands SAC is not at risk from peat slide. It is anticipated that the independent verification of the PLHRA will be 'signed-off' early in 2014.

iii) Spoil heaps, cable laying deer management plan

SSER notes SNH's view, that providing the proposal is amended so that the works are done strictly in accordance with the following conditions, the risk of a significant effect on the qualifying interests of the Caithness and Sutherland SAC can be avoided:

- SNH to approve plans for the removal, storage and reuse of spoil heaps prior to construction;
- SNH to approve the Working Method Statement for cable laying prior to construction; and
- SNH to approve a competent Deer Management Plan prior to construction.

SSER note these conditions and associated additional points in 3.2.iii, and it confirms its acceptance of these conditions, if the development was approved, to ensure SAC habitats were fully protected,

iv) Track widening and up-grade

SSER note and welcome SNH's conclusion that track widening and up-grade will not cause an adverse effect on the integrity of the Caithness and Sutherland Peatlands SAC.

b. Otter

As highlighted above, SLR, conclude that the Caithness and Sutherland Peatlands SAC is not at risk from peat slide. Consequently, the risk to otter habitat is therefore considered to be negligible. We trust SNH is able to remove its objection in this respect.

3.3. European protected species - wildcat

We note SNH's assessment that the long term status of wildcat in the area is unlikely to be affected by the proposed development. Given the presence of suitable habitat, however, SSER re-affirms its acceptance of SNH's recommended mitigation measures that are set out in Section 10.7.1 of the 2007 ES and A10.6 of the ES Addendum. These are pre-commencement surveys ahead of forestry

and construction works, and the immediate adoption of exclusion zones should any dens be identified, with a requirement to seek immediate further advice from SNH.

3.4. Habitats Directive – Annex 2 species – Atlantic salmon and freshwater pearl mussel

As highlighted above, SLR, conclude that the Caithness and Sutherland Peatlands SAC is not at risk from peat slide. Consequently, the risk to the habitat of either species is considered to be negligible. In addition, as reported in the Addendum, surveys and desk studies have confirmed that freshwater pearl mussel have not been recorded in the site or its catchments. We trust therefore that SNH no longer has concerns in relation to these species.

3.5. Protected mammals

We note SNH's recommendations to minimise the risk to pine marten and water vole. SSER confirms its acceptance of SNH's recommended mitigation measures that are set out in Section 10.7 of the 2007 ES and A10.6 of the ES Addendum. These are pre-commencement surveys ahead of forestry and construction works, and the immediate adoption of exclusion zones should any dens or burrows be identified, with a requirement to seek immediate further advice from SNH.

Annex 2 of the SNH Letter

We are pleased to provide clarification below to the specific points raised in Annex 2 of the SNH letter.

A14 Soil and Water

We acknowledge SNH's advice and confirm that the mitigation measures described will be incorporated in the final versions of the Construction Environmental Management Plan (CEMP), prepared as a condition of consent.

Technical Appendix A4.1 CEMP

We acknowledge SNH's comments and advise that these can be addressed in the final versions of the CEMP, prepared as a condition of consent.

Technical Appendix A4.3 Peat Management Plan (PMP)

We acknowledge SNH's comments and advise that these can be addressed in the final versions of the PMP, prepared as a condition of consent.

Technical Appendix 14.1 Peat Landslide and Hazard Assessment

Page 16, Section 4.2 Methodology
All of the probes were used to contour the peat, although only the 1,465 probes undertaken by SLR were used in assessing risk as the original data did not interpret the substrate.

Page 18 section 5.1 Peat
Please find enclosed table in the manner requested.

Peat Depth Range (m)	Number of Probes	%
<0.5	511	20.7
0.5-1.0	652	26.5
1.0-1.5	416	16.9
1.5-2.0	310	12.6
2.0-2.5	204	8.3
2.5-3.0	206	8.4
3.0-3.5	46	1.9
>3.5	117	4.7
Total	**2,462**	**100**

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Page 23 Section 6.1.1 Slope Gradients
It is agreed this should have stated 5 degrees but as the site is generally very flat the use of either 4 or 5 degrees is actually not significant. SLR initially prepared drawings with 2, 4 and 5 degrees and the 5 degree drawing illustrated the key feature at the site which is the extensive flat nature of the site interrupted by two elongate ridges in a north – south orientation, with minor rock outcrops present along these ridges.

Copies of both of these drawings have been attached for comparison, in Appendix 4 of this letter.

Page 25-29 Section 6.1 Risk Rating
Substrate Conditions are used to calculate the risk rating for every point probed. The stability risk rating is included as Appendix A in the PSHRA report. A combination of peat thickness, slope and substrate combine to determine peat instability across the site.

Table 6-5 illustrates the interpreted risk rating at each turbine location.

Page 27-29
As described earlier, the design approach has been to avoid deeper areas of peat where possible. The turbine locations have been proposed with consideration of a range of environmental and technical constraints, of which peat depth is only one. This process is described in Chapter A4 and Figure A4.2 of the ES Addendum. The Applicant has requested the ability to micro-site turbines by up to 50m as a condition of consent and would take account of peat depth when carrying out pre-construction site investigations to determine the precise turbine positioning.

Page 33 Section 6.4 Results
SLR can confirm that the coefficients of substrate were used to compile Figure 7. A separate table for impact rating has not been requested by Scottish Government or its consultants carrying out the independent review of the PLHRA and as such it is not considered necessary to prepare such a table for SNH.

2nd Paragraph
We note and accept this clarification.

Page 34 Section 6.4
The areas selected were based on areas of Medium or High Risk identified on Figure 7 which intersect proposed turbine locations, infrastructure or tracks. These are shown on Drawing 7. These were then considered in relation to the water courses judged to be the most sensitive receptor to a peat slide event. The reason these have all been adjusted to insignificant is the generally flat nature of the site, the distance to the water courses and the overall likelihood of the construction activity on this site triggering a peat slide. The site currently has extensive roads which are cut in peat with no evidence of any peat slide activity as a consequence of this activity or historical activity. In conclusion this is a very low peat slide risk site.

Page 37 Section 7.1.1 Specific Locations
The site is on a flat site but adjacent to a steep slope accessing the site. SLR was also considering the likely position of the associated infrastructure (crane pad). It is acknowledged that this was not clear in the text.

Page 38 Section 7.2 Access Tracks
This refers to excavated roads which in all likelihood will be on glacial material not peat and there is no inference that this will lower the water table, it is primarily to handle run-off in a sensible manner.

Page 40 Section 8.1 Conclusions
As explained earlier, peat depth was considered as a design constraint and was taken into account in the design evolution process. However peat depth is only one of many environmental and technical

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constraints which required to be considered and as such it is not possible to avoid deeper areas of peat entirely. This approach has been accepted by SEPA whom act as lead regulator on this matter. Furthermore, as stated above, the Applicant has requested the ability to micro-site turbines by up to 50m as a condition of consent and would take account of peat depth when carrying out pre-construction site investigations to determine the precise turbine positioning.

Page 41 Section 8.2.2 Turbines
We concur that the selection of the best site is always the main priority, including micrositing to shallower locations. There is no implication that an engineering solution takes preference over micrositing.

Page 41 Section 8.2.3 Access Track
The use of a peripheral bund is often used in cut slopes, high walls of quarries, etc. to minimise run-off on new slopes, particularly if peat is present upgradient. This diverts run-off to drains where it can be managed more easily.

3. Landscape, Visual Impact, Recreation and Tourism

The information provided below covers the points raised in SNH's 20th November response in relation to landscape, visual impact, recreation and tourism. For ease of reference, where relevant, the letter's paragraph number is provided. The points raised within the body of the letter are covered initially, followed by the points SNH raise in the letter's Annex 2.

3.6 Landscape and Visual Impact

a. Kyle of Tongue National Scenic Area (NSA)

SSER notes that SNH's advice in regard to the NSA remains unchanged since its 2nd October 2007 response.

b. Landscape Character

SSER notes and welcomes SNH's view that the proposed 2013 Modified Layout is considered to be within the capacity of the landscape in which it is located.

c. Special Landscape Areas

We are aware of previous concern highlighted by SNH regarding turbines T35, T41, T39 and T36 and the potential for them to appear "detached" from the main group in the view from Ben Griam Beg. This was a consideration during the design process and indeed a matter of consultation with SNH prior to the submission of the ES Addendum. However the landscape and visual specialists, ASH design + assessment, continue to consider that their removal would not make a material difference. We therefore reaffirm SSER's position on the retention of these turbines.

d. Wild Land

SSER welcome SNH's view that the proposed 2013 Modified Layout would not produce significant adverse impacts on Search Areas for Wild Land. SSER therefore note SNH's advice regarding wild land remains the same as its 2nd October 2007 response.

e. Visual Impacts

SSER notes SNH's recommendation regarding transformers but is not in a position to agree to internal transformers at present as this is dependent upon the ultimate turbine manufacturer'.

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f. Cumulative Impacts

SSER notes and welcomes SNH's conclusion that the proposed Strathy South and Strathy North turbines would not, in conjunction, significantly impact upon the wider appreciation of the Caithness and Sutherland seaboard and hinterland moorland and mountains.

3.8 Recreation and Tourism

The Applicant would be willing to agree a condition of consent in relation to access arrangements during construction.

We very much appreciate the time and assistance of SNH staff in reviewing the clarifications above. We hope we have provided all the information requested, but please do not hesitate at all to contact us if there are any further details we can provide. We look forward to hearing from you at your earliest possible convenience in this regard, and to meeting should there be any further issues to resolve. Thank you once again for your time and consideration.

Yours sincerely
for RPS

Dr. Simon Zisman
Operational Director

APPENDIX 1. CLARIFICATION OF COLLISION RISK MODELLING METHODOLOGY

This section details the collision risk modelling undertaken, as advocated by SNH. Worked examples are provided for hen harrier and red-throated diver to illustrate the modelling process used. The modelling is based on the 2013 Modified Layout with eight turbines deleted, and therefore models the predicted collision rate for 39 turbines.

1.1 Choice of Directional or Non-Directional Models

For each target species, a collision rate was estimated using either a directional or non-directional (random) collision risk model. The choice of modelling method was based on the flight behaviour of the species of interest within the proposed wind farm area following the guidance provided in SNH (2000).

1.2 Definitions: the Wind farm Polygon, Flight Selection Polygon, Risk Window and Risk Volume

The area of analysis is defined as the *wind farm polygon*. Commonly this is determined as the boundary around the extremities of the turbines (technically referred to as a convex hull, but see Section 1,3).

A *flight selection polygon* for each vantage point was defined as the overlap of the viewshed (the polygon of theoretical visibility) with the wind farm polygon buffered by 200m (this buffer is applied to accommodate spatial imprecision of field mapping (see SNH 2010)).

The *risk volume* is defined as the volume of airspace over the wind farm polygon at rotor height and is used in non-directional models (SNH 2000).

The *rotor-swept volume* is defined as the total volume of air swept by all of the rotors in the wind farm. For an individual rotor this is determined by the area swept (πr^2) multiplied by the thickness of the rotor blades plus the length of the focal species (SNH 2000).

The *risk window* is defined as a line that bisects the wind farm across the mean direction of travel of the relevant species through the wind farm polygon (SNH 2000; but also see "Calculation of the number of rotor transits" for red-throated diver below). This measure is used in the directional model.

1.3 Determining wind farm polygons for analysis

SNH does not provide standard guidance on defining the extent of the wind farm polygon. For wind farms with simpler turbine layout than at the proposed Strathy South wind farm (such as, for example, Strathy North), this is less of an issue, because turbines are distributed within a regular shape, and it is therefore relatively straightforward to define the area enclosed by the tips of the outermost turbine rotors (i.e. the convex hull of the extremities of turbines). However, where proposed turbines present an irregular shape, such as Strathy South, a convex hull would (a) fail to preserve the shape of the development and (b) result in areas of potentially unrepresentative habitat being included in the analysis.

As the proposed turbines at Strathy South form such an irregular shape, include a habitat corridor as an integral part of the mitigation, and are surrounded by highly differing habitats (forest plantation versus open moorland), an algorithmic solution was therefore used to help define an appropriate wind farm polygon[1]. The definition of the final wind farm corridor also needed to reflect the habitat corridor

[1] The concave hull algorithm implemented in PostGIS (Postgis.refractions.net n.d.) was investigated but failed to sufficiently preserve the shape of the layout. A polygon that encompassed the proposed turbines and defined the area of risk was,

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included as embedded mitigation in the northwest part of the wind farm. The purpose of this corridor is to avoid nesting locations in this area and to maintain space for birds to pass between turbines. A single wind farm polygon, even if derived algorithmically as described in footnote 1, would still have encompassed this corridor, and therefore masked the beneficial effects reducing collision risk. It was therefore necessary to split the wind farm polygon, resulting in one wind farm polygon for the distinct turbine grouping to the north of this habitat corridor. Following the proposed deletion of turbines, the grouping of three remaining turbines forms a simple triangle so a concave hull algorithm was not necessary and a convex hull was used. The resulting polygon is shown in Figure 1: polygon 1. Whilst there was no clear corridor between the remainder of the turbines, they were split into two further polygons to preserve the distinctive "U" shape of the proposed development and exclude the unrepresentative habitat of Yellow Bog (Figure 1: polygons 2 and 3).

1.4 Parameters

Parameters used in the collision models are provided below. Morphometric measurements for bird species were taken from BTO.org (2013) with flight speeds from Alerstam *et al.* (2007) or alternatively from Bruderer and Boldt (2001). Turbine specifications are from Repower.de (2012) except blade pitch, which varies during operation and the value of 10° presented here is taken from knowledge of Siemens turbines.

CRM TECHNICAL PARAMETERS		
Parameters	**Measurement**	**Units**
Number of turbines	39	
Blades per turbine	3	
Hub height	83	Metres
Rotor radius	52	Metres
Maximum chord	3.8	Metres
Pitch	10	Degrees
Rotation period	4.35	seconds
Proportion operational	0.85	

CRM BIOMETRIC PARAMETERS					
Parameter	**Red-throated diver**	**Black-throated diver**	**Hen harrier**	**Golden eagle**	**Greenshank**
Bird length (m)	0.61	0.66	0.48	0.82	0.32
Wingspan (m)	1.11	1.2	1.1	2.12	0.69
Bird speed (m/s)	18.6	19.3	9.1	11.9	12.3
Avoidance rate	0.98	0.98	0.99	0.99	0.98
Months active	1st May – 15th September	1st May – 15th September	16th March – 31st August	16th March – 31st August	1st April – 31st July
Flight style	Flapping	Flapping	Flapping	Gliding	Flapping

1.5 Collision analysis worked examples

As requested by SNH, a worked example for each of the directional and non-directional models is provided below, together with the detailed workings in the Annex to this Appendix. The process was run for each of the three parts of the wind farm's wind farm polygon, and then summed to give the predicted collision rate for the wind farm as a whole. The worked examples below use polygon 2 (Figure 1), but would be no different from the modelling for polygons 1 and 3.

For ease of reading, values are presented to a maximum of three decimal places however calculations were performed with floating point precision.

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however, achieved by (i) creating a concave hull-like polygon by buffering the points representing the turbine locations by a large distance, (ii) merging the resultant polygons, then (iii) buffering this output by a negative large distance that is slightly smaller then the initial buffer distance (by the rotor radius).

RPS

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1.6 Regular flights through a wind farm (directional model): red-throated diver breeding season, (1st May 2012 to 15th September 2012), wind farm polygon 2

Selection of flights for inclusion

Flights were selected or excluded from the analysis according to the following rules:

- Flights were rejected from the analysis if they were wholly over 2km from their respective vantage point.
- Flights must have intersected their respective flight selection polygon and have been observed in a height band that overlaps with turbine rotor height (bands 2, 3 and 4)

HEIGHT BAND	Height range (m)	Proportion of overlap with turbine rotors
1	0 – 20	0
2	20 – 40	0.45
3	40 – 100	1.0
4	100 – 150	0.7
5	150 +	0

Calculation of effort

The zone of theoretical visibility to 20m above ground level was calculated to a maximum distance of 2km from each vantage point using ESRI's ArcGIS Spatial Analyst extension (ESRI 2013) with Ordnance Survey's Panorama digital terrain data (Ordnance Survey 2013). For each vantage point the area of visible extent within the wind farm polygon was multiplied by the sum of observed time to give effort in terms of time observed per unit area thus:

Vantage point	3	15	16	17	18	19	20	21
Observed time (hours)	57	48	48	60	54	48	54	48
Area of wind farm polygon 2 visible within viewshed (km^2)	0	0	0	0.697	1.196	0.119	1.062	0
Effort at each VP (time * area)	0	0	0	41.812	64.599	5.717	57.341	0

The proportion of effort at each VP was calculated as the effort of the focal VP divided by the summed effort of all VPs:

Vantage point	3	15	16	17	18	19	20	21
Proportion of effort at each VP	0	0	0	0.25	0.38	0.03	0.34	0

Rate of bird activity

For each vantage point the number of birds from flights selected for inclusion in analysis was summed:

Vantage point	3	15	16	17	18	19	20	21
Number of birds observed within the wind farm at risk height for polygon 2	0	0	0	15	12	0	0	0

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A rate of activity in terms of birds per hour per km^2 was calculated by dividing this value by the vantage point's respective effort.

Vantage point	3	15	16	17	18	19	20	21
Rate of birds per hour per km^2 for polygon 2	0	0	0	0.359	0.186	0.000	0.000	0

These rates were weighted for differing effort by multiplying by the proportion of effort at each VP calculated above (e.g. for VP 17: 0.359 * 0.25 = 0.089).

Vantage point	3	15	16	17	18	19	20	21
Rate of birds per hour per km^2 weighted for effort	0	0	0	0.089	0.071	0.000	0.000	0

Summing the weighted rates gives a single rate of 0.159 birds per hour per km^2 of bird activity for the wind farm polygon.

Calculation of the number of rotor transits

The number of transits of the rotor was calculated following the method described in Band (2000).

- The potentially active hours between 1st May to 15th September 2012 were calculated as daylight hours plus 25 % of night time hours, thus accounting for an assumed level of crepuscular activity, using the model described in Forsythe *et al.* (1995) as 2,543.45 hours.

- The "risk window" described in SNH (2010) was determined as follows:

    - The circular mean and standard deviation of the bearings of flight lines (from start to end point) were calculated.
    - A standard deviation of less than 0.5 indicated a true pattern of flight direction and therefore the risk window could be calculated across the wind farm polygon perpendicular to the circular mean direction; this was not the case in this example.
    - If the standard deviation was greater than or equal to 0.5, no clear orientation of flights was evident, as with this particular case, and the risk window length was calculated as the mean of the wind farm width and length (i.e. the mean of its bounding box dimensions). In the case of wind farm polygon 2, this was 1,537m.

- The risk window area was calculated by multiplying the risk window length by the diameter of the turbine rotors (104 m): 159,860 m^2.

- The two dimensional rotor swept area for the wind farm polygon was calculated as the area of a single turbine rotor disc multiplied by the number of turbines: 8,495 m^2 * 9 turbines in wind farm polygon 2 = 76,454 m^2.

- The predicted number of birds flying through the risk window during the analysis period was calculated as the product of the summed rate of bird activity with the wind farm polygon area (1.284 km^2 for polygon 2) and the potentially active time during the analysis period: 0.159 * 1.284 km^2 * 2,543.45 h = 520 birds.

- The number of birds transiting the rotors during the analysis period was calculated by multiplying the number of birds flying through the risk window by the ratio of the rotor swept area to the risk window area: 520 * (76,454 m^2 / 159,860 m^2) = 249.849 transits.

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Probability of collision of a single transit

The probability of collision of a single rotor transit was calculated following SNH (2000). The following parameters are used as inputs to this part of the model (morphometric measurements were taken from BTO.org (2013) with flight speeds from Alerstam *et al.* (2007); turbine specifications are from Repower.de (2012) except pitch which is varies during operation and the value of 10 ° presented here is taken from knowledge of Siemens turbines):

TURBINE MODEL	**REPOWER-3.4-M104**
Hub height	83 m
Rotor diameter	104 m
Blade maximum chord	3.8 m
Rotation speed	13.8 m s^{-1}
Blade pitch	10 °
Species	**Red-throated diver**
Body length	0.61 m
Wingspan	1.11 m
Primary flight type	Flapping
Flight speed	18.6 m s^{-1}

The resultant value (the mean of upwind and downwind values) is a probability of collision of 0.070 for a single transit of the turbine rotors. As this is a standard calculation the workings are not presented here; this value can be reproduced using the spreadsheet available from SNH's website http://www.snh.gov.uk/docs/C234672.xls.

Calculation of number of collisions

The estimated number of red-throated diver collisions during the breeding season for wind farm polygon 2 was determined by combining the estimated number of rotor transits with their probability of collision, an assumed 85 % turbine operational rate, and the avoidance rate specified in SNH (2010) (98 %) thus: 249.849 transits * 0.070 * 0.85 * 0.02 = 0.295 collisions per breeding season.

1.7 Birds using the wind farm airspace (non-directional): Hen harrier breeding season, 16th March 2012 to 31st August 2012, polygon 2

Selection of flights for inclusion

Flights were selected or excluded from the analysis according to the following rules:

- Flights were rejected from the analysis if they were wholly over 2km from their respective vantage point.
- Flights must have intersected their respective flight selection polygon and have been observed in a height band that overlaps with turbine rotor height.

Time at potential collision height

For each flight, the amount of time at potential collision height (PCH) was estimated by multiplying the time observed at each height band by the proportion of overlap of the height band with the turbine rotors, and then summing these values across height bands. The proportional overlap between height bands and rotors is given below:

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Height band	Height range (m)	Proportion of overlap with turbine rotors
1	0 - 20	0
2	20 - 40	0.45
3	40 - 100	1.0
4	100 - 150	0.7
5	150 +	0

The estimated time at PCH for each flight was then adjusted by multiplying by the proportion of the flight's length within the flight selection polygon to give an estimate of time at PCH within the flight selection polygon.

The time at PCH within the flight selection polygon was summed for flights of hen harrier at each vantage point providing the following input to the model:

Vantage point	3	15	16	17	18	19	20	21
Seconds of bird activity observed at PCH for polygon 2	0	0	0.494	7.812	407.250	0.130	16.135	0.000

Calculation of effort

The zone of theoretical visibility to 20m above ground level (i.e. the area of visible extent) was calculated to a maximum distance of 2km from each vantage point using ESRI's ArcGIS Spatial Analyst extension (ESRI 2013) with Ordnance Survey's Panorama digital terrain data (Ordnance Survey 2013). For each vantage point the area of visible extent within the wind farm polygon was multiplied by the sum of the observed time to give the estimated effort in terms of time observed per unit area thus:

Vantage point	3	15	16	17	18	19	20	21
Observed time (hours)	69	57	57	69	66	60	60	58
Area of wind farm polygon 2 visible within viewshed (km^2)	0	0	0	0.7	1.2	0.12	1.06	0
Effort at each VP (time * area)	0	0	0	48.1	79	7.15	63.7	0

The proportion of the total effort at each VP was calculated as the effort of the focal VP divided by the summed effort of all VPs:

Vantage point	3	15	16	17	18	19	20	21
Proportion of effort at each VP	0	0	0	0.24	0.4	0.04	0.32	0

Rate of bird activity

The rate of activity at each VP in terms of seconds per hour per km^2 was calculated by dividing the seconds of activity by the vantage point's respective effort (e.g. for VP 17: 7.812 / 48.1 = 0.162), giving:

Vantage point	3	15	16	17	18	19	20	21
Seconds of bird activity observed at PCH for polygon 2	0	0	0.494	7.812	407.250	0.130	16.135	0.000
Rate of bird activity for polygon 2 (seconds per hour per km^2)	0	0	0.000	0.162	5.158	0.018	0.253	0

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These rates were weighted for differing effort by multiplying them by the proportion of effort at each VP calculated above (e.g. for VP 17: 0.162 * 0.24 = 0.039), giving:

Vantage point	3	15	16	17	18	19	20	21
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0.000	0.039	2.058	0.001	0.082	0.000

Summing the weighted rates gives a single rate of 2.180 seconds per hour per km^2 of bird activity for the wind farm polygon.

Calculation of the number of rotor transits

The number of transits of the rotor was calculated following the method described in Band (2000).

- Daylight hours between 16th March 2012 and 31st August 2012 were calculated using the CBM model described in Forsythe *et al.* (1995) as 2,718.88 hours.
- The estimated bird time in the risk volume was calculated as the product of the rate of bird activity within the wind farm polygon 2 area (1.284 km^2) and the daylight hours during the analysis period: 2.180 * 1.284 km^2 * 2,718.88 h = 7,609s.
- The estimated bird time in the rotor swept volume was calculated as the bird time in the risk volume multiplied by the proportion of the rotor swept volume to the risk volume (*Vr/Vw*): 7,609 s * (327,222m^3/ 133,540,160m^3) = 18.645s.
- The time for a bird to make one transit of the rotors was calculated as the sum of the maximum chord plus the length of the bird, divided by the flight speed: (3.8m + 0.48m) / 9.1m s^{-1} = 0.470s.
- The number of transits during the analysis period was calculated by dividing the estimated time in the risk volume by the time to make a single transit: 18.645 s / 0.470s = 39.643 transits.

Probability of collision of a single transit

The probability of collision of a single rotor transit was calculated following SNH (2000). The following parameters are used as inputs to this part of the model (morphometric measurements were taken from BTO.org (2013) with flight speeds from Alerstam *et al.* (2007); turbine specifications are from Repower.de (2012) except pitch which varies during operation and the value of 10 ° presented here is taken from knowledge of Siemens turbines):

Turbine model	REpower-3.4-M104
Hub height	83 m
Rotor diameter	104 m
Blade maximum chord	3.8 m
Rotation speed	13.8 m s^{-1}
Blade pitch	10 °
Species	**Hen harrier**
Body length	0.48 m
Wingspan	1.1 m
Primary flight type	Flapping
Flight speed	9.1 m s^{-1}

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The resultant value (the mean of upwind and downwind values) is a probability of collision of 0.084 for a single transit of the turbine rotors. As this is a standard calculation the workings are not presented here; this value can be reproduced using the spreadsheet available from SNH's website http://www.snh.gov.uk/docs/C234672.xls.

Calculation of number of collisions

The estimated number of hen harrier collisions during the breeding season for wind farm polygon 2 was determined by combining the estimated number of rotor transits with their probability of collision, an assumed 85 % turbine operational rate, and the avoidance rate specified in SNH (2010) (99 %) thus: 39.643 transits * 0.084 * 0.85 * 0.01 = 0.028 estimated collisions per breeding season.

1.8 References

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APPENDIX 2. STRATHY SOUTH WIND FARM: EFFECTS OF DISTANCE ON RECORDED GREENSHANK FLIGHT ACTIVITY – AMENDED ANALYSIS TO CONSIDER DISTANCE EFFECTS ON DETECTABILITY BY INCORPORATING A 0 – 250M DISTANCE BAND

1. Introduction

The effect of distance on the detectability of greenshank and golden plover flights was examined in Appendix 11.3 of the Strathy South ES Addendum using a generalised linear mixed model (GLMM), which examined how the recorded flight activity density (FAD) changed between <0.5 km, 0.5 - 0.99 km and 1 – 2 km distance bands out from the vantage point (VP) (RPS 2013). This demonstrated an effect of distance on FAD, strongly suggesting that the detectability of these species declined with distance from the VP (although some of this effect may also have been attributable to confounding habitat variation with distance from VPs). Based upon this distance effect on FAD, the estimated collision rates for these two species were adjusted to account for the potential decline in detectability with distance (RPS 2013).

Whilst commending the approach taken in Appendix 11.3 to correcting collision estimates according to potential variation in flight detectability, SNH have raised concerns that this analysis may have underestimated the detectability correction factor for greenshank because of a possible decrease in detectability within the first distance band (i.e. <0.5 km). SNH make the specific suggestion that 100% detectability of greenshank should only be assumed up to a distance of 250m from the VP. To address this concern, the previous analysis was re-run using four distance bands in place of the original three; i.e. <0.25 km, 0.25 – 0.49 km, 0.5 – 1 km and 1 – 2 km. This reanalysis was undertaken using exactly the same approach as before except that data on golden plover were removed because the SNH concerns were specific to greenshank, and focussing on a single species simplified the analytical process. Details of the output from this re-analysis, along with a re-working of correction factors and an interpretation of the findings and their implications for considering greenshank collision risk at the proposed Strathy South wind farm are given below.

2. Re-Analysis of Flight Activity in Relation to Distance

Of the terms included in the GLMM to examine variation in FAD, distance band was the only term to be retained within the final minimum adequate model (MAM). Thus, the final MAM included distance band only, with the parameter estimates showing that FAD declined with distance from the VP after an initial increase from Band 1 (<0.25 km) to Band 2 (0.25 – 0.50 km; Table 1). For clarity, the three-band model is referred to as the original model and the four-band model is referred to as the adjusted model.

TABLE 1. PARAMETER ESTIMATES AND ASSOCIATED OUTPUT FOR THE MINIMAL ADEQUATE MODEL RESULTING FROM THE GENERALISED LINEAR MIXED MODEL TO EXAMINE VARIATION IN FLIGHT ACTIVITY DENSITY.

Parameter	Value (S.E.)	D.F.	*t*-value
Intercept	18.87 (7.50)	153	2.52 *
Distance band 2 (0.25 – 0.50 km)	19.24 (9.08)	153	2.12 *
Distance band 3 (0.50 – 1.00 km)	-1.05 (9.08)	153	-0.12
Distance band 4 (1.00 – 2.00 km)	-17.34 (9.08)	153	-1.91 ·

Notes: Level of statistical significance indicated as follows - · *P* ≈ 0.05, * *P*<0.05 ** *P*<0.01, ***P*<0.001

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The results of the adjusted model show that FAD increases from Band 1 (0.00 – 0.24 km) to Band 2 (0.25 – 0.99 km), in contrast to the original model which assumed equal FAD from 0.00 – 0.50 km. Furthermore, the difference in FAD between Bands 1 and 2 in the adjusted model was statistically significant ($P < 0.05$). FAD is highest at Band 2 (0.25 – 0.99 km) compared to all other bands surveyed. The results of the adjusted model show that Band 3 (0.50 – 1.00 km) has higher estimated FAD compared to the original model, whilst Band 4 (1.00 – 2.00 km) has marginally lower estimated FAD compared to the original model (Figure 1). With regards to the occurrence of flight records, 10, 20, 35 and 22 of the 42 surveys contained flight records in Bands 1, 2, 3 and 4, respectively for the adjusted model. The differences in the occurrence of positive records within each of the distance bands reflected a combination of differences in recorded flight activity and in the area of the viewshed encompassed within the bands (with area increasing from Band 1 to 4). In the original model, 35, 44 and 28 surveys contained flight records in Bands 1, 2 and 3, respectively (the greater overall number of records in the original model being due to the inclusion of flights for golden plover).

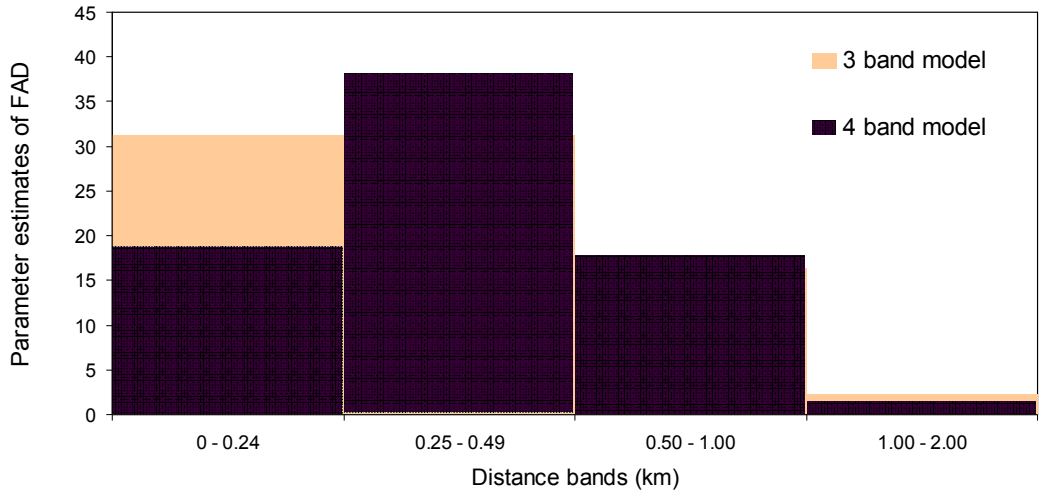

FIGURE 1. PARAMETER ESTIMATES FOR THE MINIMUM ADEQUATE MODELS OF THE THREE-BAND MODEL AND THE FOUR-BAND MODELS TO EXAMINE FLIGHT ACTIVITY DENSITY (FAD).

Overall, FAD decreases with distance beyond 0.5 km, as recorded in the original model of the Technical Appendix 11.3 (RPS 2013). This decrease in FAD was also detected in the adjusted model (see Table 1 and Figure 1), but with the 0.5 km distance band subdivided the adjusted model also showed a statistically significant increase in FAD from <0.25 km to 0.25 – 0.50 km. The cause of the increase in greenshank detection between Bands 1 and 2 in the adjusted model is unclear and, at least initially, seems counter-intuitive because detectability will not increase from Band 1 to Band 2. However, as detailed in Appendix 11.3, variation in FAD may be affected by other factors in addition to detectability, notably variation in habitat. One possibility for the increase in FAD from Bands 1 to 2 is that VPs are situated in locations where greenshank flight activity is less likely (e.g. on elevated ground), whilst the small area encompassed by the distance band 1 (and hence low probability of flight occurrence) is also likely to have contributed (i.e. the mean area of land in distance bands 1, 2, 3 and 4 of the different VPs being 0.09, 0.29, 1.10 and 4.16 km2, respectively).

3. Re-calculation of Corrected Estimates of Flight Activity

Based upon the revised analysis and adjusted model, a corrected estimate of the overall FAD was calculated using the raw data as in Appendix 11.3 (see section 2.2 of Appendix 11.3). However, in this instance data from Band 1 in the revised analysis were omitted due to the fact that FAD was lower in Band 1 than in Band 2. Thus, for the purposes of re-calculating a corrected estimate of FAD, Band 2 was made the reference level and estimates of FAD in Bands 3 and 4 were 'corrected' according to the proportional difference between Bands 2 and 3 and Bands 2 and 4, respectively, in the summed FADs from the individual surveys. This produced correction factors of 2.05 and 13.37 for Bands 3 and

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4, respectively (which compared with values of 1.9 and 12.1 as originally calculated for these distance bands in Appendix 11.3). Applying these correction factors to obtain corrected FADs for each survey (as in section 3.2 of Appendix 11.3) produced an estimated FAD that was 5.0 times greater than the uncorrected value (which compared to a value of 4.4 as calculated in Appendix 11.3).

4. Implications for the interpretation of greenshank collision risk

The re-analysis of greenshank flight activity data, undertaken to allow examination of the 'near-distance' effects on FAD, indicates an increase in FAD from <0.25 km to 0.25 – 0.5 km of VP locations. As such, the revised analysis provides no evidence for any decline in flight detectability within 0.5 km of VP locations, although it is possible that the low flight activity recorded within 0.25 km of VPs is, in part, an artefact of the habitat within the immediate vicinity of the VP locations. Recalculating the correction factor by omitting data from the <0.25 km distance band gives a figure that is only slightly greater than that calculated previously, suggesting that the corrected estimates of FAD presented in Appendix 11.3 were relatively reliable. Applying the recalculated correction factor (i.e. 5.0) to the estimated greenshank collision risk figures (based upon a 98% avoidance rate) gives the following for:

- The 47 turbine design: Estimated collisions increase from 0.03 to 0.15 per annum, equivalent to one death every six to seven years.

- The 39 turbine design: Estimated collisions increase from 0.01 – 0.012 to 0.05 – 0.06 per annum, equivalent to one death every 16 to 20 years.

Although the findings of the revised analyses suggest that it is unlikely that the detectability of greenshank flights is markedly lower within the 0.25 – 0.5 km distance band than within the <0.25km band, the possibility remains that there is some underestimation of flight activity at 0.25 – 0.50 km. Underestimation of flight activity in this distance band will cause the correction factor to be underestimated, given that the FAD in this band provides the reference level. At the same time, other factors may cause overestimation of the correction factor, most notably the high proportion of afforested land in the 1 – 2 km distance band (which is likely to mean that habitat effects, as well as reduced detectability, contribute to the lower FAD recorded in this band). However, even assuming a highly unlikely scenario where flight detectability at 0.25 – 0.50 km is just 50% (so doubling the correction factor), the corrected collision risk estimates would increase to: (i) 0.30 collisions per annum for the 47 turbine design (equivalent to one death every three years and (ii) 0.10 – 0.12 collisions per annum for the 39 turbine design (equivalent to one death every eight to 10 years).

5. References

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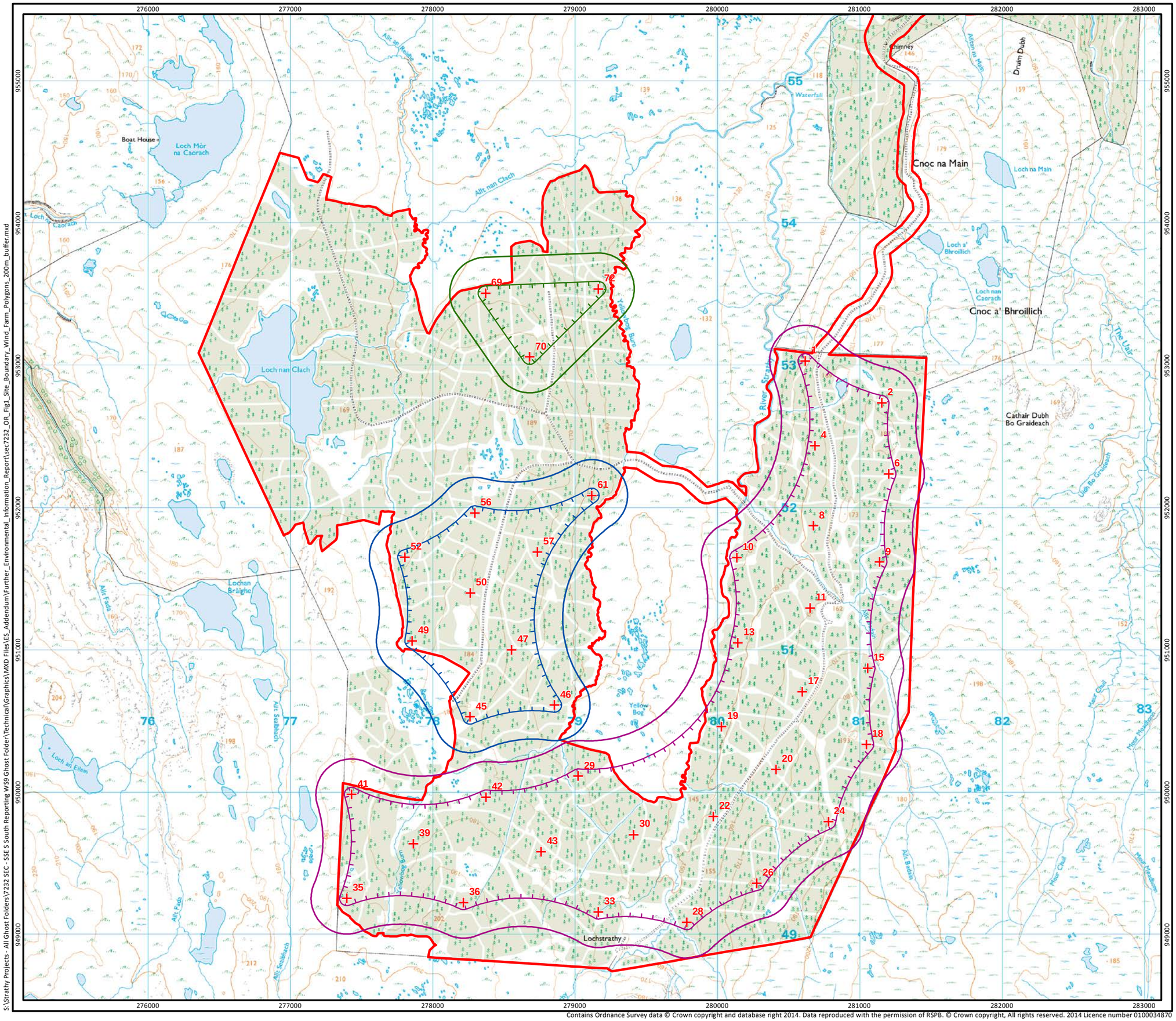

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SSE Renewables

RPS

Key

- Turbines
- Site Boundary

Wind Farm Polygon

- Polygon 1
- Polygon 2
- Polygon 3

200 m wind farm polygon buffer

- Wind farm polygon 1
- Wind farm polygon 2
- Wind farm polygon 3

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Scale 1:25,000 @ A3

0 0.25 0.5 1 km

Figure 1
Site Boundary and Wind Farm Polygons used in the CRM

Further Environmental Information Report

Strathy South, polygon 1: non-directional CRA summary for HH, Raptor breeding 2003, (2003-03-16 to 2003-08-31; 169 days)				
Turbine model	REpower-3.4-M104			
Hub height	83			
Rotor diameter	104			
Blade maximum chord	3.8			
Rotation speed	13.8			
Blade pitch	10			
Number of turbines	3			
Layout name	polygon 1			
Vantage point	1	2	3	4
Observed time (hours)	42	39	33.33333333	36
Area of windfarm visible within viewshed (km^2)	0.224208	0	0	0
Effort at each VP (time * area)	9.416736	0	0	0
Proportion of effort at each VP	1	0	0	0
Number of flights observed at PCH	0	0	0	0
Seconds of bird activity observed at PCH	0	0	0	0
Rate of bird activity (seconds per hour per km^2)	0	0	0	
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	0			
Turbine area (convex hull buffered by radius; km^2)	0.295794			
Risk volume (m^3)	30762576			
Number of turbines	3			
Rotor swept volume (m^3)	109074.0863			
Vr/Vw	0.003545675			
Daylight during analysis period (hours)	2716.522621			
Estimated bird time in risk volume (seconds)	0			
Estimated bird time in rotor swept volume (seconds)	0			
Time for bird to transit rotors (seconds)	0.47032967			
Number of transits	0			
Probability of collision (Band model)	0.083503065			
Collisions during study period with 100 % operation and no avoidance	0			
Collisions during study period with 85 % operational rate and no avoidance	0			
SNH recommended avoidance rate	0.99			
Collisions during study period with 85 % operational rate with avoidance	0			

Strathy South, polygon 2: non-directional CRA summary for HH, Raptor breeding 2003, (2003-03-16 to 2003-08-31; 169 days)				
Turbine model	REpower-3.4-M104			
Hub height	83			
Rotor diameter	104			
Blade maximum chord	3.8			
Rotation speed	13.8			
Blade pitch	10			
Number of turbines	9			
Layout name	polygon 2			
Vantage point	1	2	3	4
Observed time (hours)	42	39	33.33333333	36
Area of windfarm visible within viewshed (km^2)	0	1.20789	0	1.158
Effort at each VP (time * area)	0	47.10771	0	41.689
Proportion of effort at each VP	0	0.530507105	0	0.469492895
Number of flights observed at PCH	0	0	0	1
Seconds of bird activity observed at PCH	0	0	0	101.6159973
Rate of bird activity (seconds per hour per km^2)	0	0	0	2.437430674
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0	1.144356382
Total weighted rate of bird activity (seconds per hour per km^2)	1.144356382			
Turbine area (convex hull buffered by radius; km^2)	1.28404			
Risk volume (m^3)	133540160			
Number of turbines	9			
Rotor swept volume (m^3)	327222.2589			
Vr/Vw	0.002450366			
Daylight during analysis period (hours)	2716.522621			
Estimated bird time in risk volume (seconds)	3991.656626			
Estimated bird time in rotor swept volume (seconds)	9.781019418			
Time for bird to transit rotors (seconds)	0.47032967			
Number of transits	20.79609269			
Probability of collision (Band model)	0.083503065			
Collisions during study period with 100 % operation and no avoidance	1.736537473			
Collisions during study period with 85 % operational rate and no avoidance	1.476056852			
SNH recommended avoidance rate	0.99			
Collisions during study period with 85 % operational rate with avoidance	0.014760569			

Strathy South, polygon 3: non-directional CRA summary for HH, Raptor breeding 2003, (2003-03-16 to 2003-08-31; 169 days)				
Turbine model	REpower-3.4-M104			
Hub height	83			
Rotor diameter	104			
Blade maximum chord	3.8			
Rotation speed	13.8			
Blade pitch	10			
Number of turbines	27			
Layout name	polygon 3			
Vantage point	1	2	3	4
Observed time (hours)	42	39	33.33333333	36
Area of windfarm visible within viewshed (km^2)	0	0.48401	2.66443	0.77692
Effort at each VP (time * area)	0	18.87639	88.81433333	27.96944
Proportion of effort at each VP	0	0.139144676	0.654682469	0.206172855
Number of flights observed at PCH	0	0	7	1
Seconds of bird activity observed at PCH	0	0	811.9989581	13.20409966
Rate of bird activity (seconds per hour per km^2)	0	0	9.142656682	0.472090173
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	5.985537052	0.097332179
Total weighted rate of bird activity (seconds per hour per km^2)	6.082869231			
Turbine area (convex hull buffered by radius; km^2)	5.39904			
Risk volume (m^3)	561500160			
Number of turbines	27			
Rotor swept volume (m^3)	981666.7768			
Vr/Vw	0.001748293			
Daylight during analysis period (hours)	2716.522621			
Estimated bird time in risk volume (seconds)	89215.0968			
Estimated bird time in rotor swept volume (seconds)	155.9741257			
Time for bird to transit rotors (seconds)	0.47032967			
Number of transits	331.6272298			
Probability of collision (Band model)	0.083503065			
Collisions during study period with 100 % operation and no avoidance	27.69189002			
Collisions during study period with 85 % operational rate and no avoidance	23.53810651			
SNH recommended avoidance rate	0.99			
Collisions during study period with 85 % operational rate with avoidance	0.235381065			

Strathy South, polygon 1: non-directional CRA summary for HH, Raptor non-breeding, (2003-09-01 to 2004-03-15; 197 days)				
Turbine model	REpower-3.4-M104			
Hub height	83			
Rotor diameter	104			
Blade maximum chord	3.8			
Rotation speed	13.8			
Blade pitch	10			
Number of turbines	3			
Layout name	polygon 1			
Vantage point	1	2	3	4
Observed time (hours)	60	60	60	60
Area of windfarm visible within viewshed (km^2)	0.224208	0	0	0
Effort at each VP (time * area)	13.45248	0	0	0
Proportion of effort at each VP	1	0	0	0
Number of flights observed at PCH	0	0	0	0
Seconds of bird activity observed at PCH	0	0	0	0
Rate of bird activity (seconds per hour per km^2)	0	0	0	
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	0			
Turbine area (convex hull buffered by radius; km^2)	0.295794			
Risk volume (m^3)	30762576			
Number of turbines	3			
Rotor swept volume (m^3)	109074.0863			
Vr/Vw	0.003545675			
Daylight during analysis period (hours)	1805.939418			
Estimated bird time in risk volume (seconds)	0			
Estimated bird time in rotor swept volume (seconds)	0			
Time for bird to transit rotors (seconds)	0.47032967			
Number of transits	0			
Probability of collision (Band model)	0.083503065			
Collisions during study period with 100 % operation and no avoidance	0			
Collisions during study period with 85 % operational rate and no avoidance	0			
SNH recommended avoidance rate	0.99			
Collisions during study period with 85 % operational rate with avoidance	0			

Strathy South, polygon 2: non-directional CRA summary for HH, Raptor non-breeding, (2003-09-01 to 2004-03-15; 197 days)				
Turbine model	REpower-3.4-M104			
Hub height	83			
Rotor diameter	104			
Blade maximum chord	3.8			
Rotation speed	13.8			
Blade pitch	10			
Number of turbines	9			
Layout name	polygon 2			
Vantage point	1	2	3	4
Observed time (hours)	60	60	60	60
Area of windfarm visible within viewshed (km^2)	0	1.20789	0	1.158
Effort at each VP (time * area)	0	72.4734	0	69.48
Proportion of effort at each VP	0	0.510532811	0	0.489467189
Number of flights observed at PCH	0	0	0	0
Seconds of bird activity observed at PCH	0	0	0	0
Rate of bird activity (seconds per hour per km^2)	0	0	0	0
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	0			
Turbine area (convex hull buffered by radius; km^2)	1.28404			
Risk volume (m^3)	133540160			
Number of turbines	9			
Rotor swept volume (m^3)	327222.2589			
Vr/Vw	0.002450366			
Daylight during analysis period (hours)	1805.939418			
Estimated bird time in risk volume (seconds)	0			
Estimated bird time in rotor swept volume (seconds)	0			
Time for bird to transit rotors (seconds)	0.47032967			
Number of transits	0			
Probability of collision (Band model)	0.083503065			
Collisions during study period with 100 % operation and no avoidance	0			
Collisions during study period with 85 % operational rate and no avoidance	0			
SNH recommended avoidance rate	0.99			
Collisions during study period with 85 % operational rate with avoidance	0			

Strathy South, polygon 3: non-directional CRA summary for HH, Raptor non-breeding, (2003-09-01 to 2004-03-15; 197 days)				
Turbine model	REpower-3.4-M104			
Hub height	83			
Rotor diameter	104			
Blade maximum chord	3.8			
Rotation speed	13.8			
Blade pitch	10			
Number of turbines	27			
Layout name	polygon 3			
Vantage point	1	2	3	4
Observed time (hours)	60	60	60	60
Area of windfarm visible within viewshed (km^2)	0	0.48401	2.66443	0.77692
Effort at each VP (time * area)	0	29.0406	159.8658	46.6157
Proportion of effort at each VP	0	0.123303058	0.678771856	0.197925087
Number of flights observed at PCH	0	0	0	0
Seconds of bird activity observed at PCH	0	0	0	0
Rate of bird activity (seconds per hour per km^2)	0	0	0	0
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	0			
Turbine area (convex hull buffered by radius; km^2)	5.39904			
Risk volume (m^3)	561500160			
Number of turbines	27			
Rotor swept volume (m^3)	981666.7768			
Vr/Vw	0.001748293			
Daylight during analysis period (hours)	1805.939418			
Estimated bird time in risk volume (seconds)	0			
Estimated bird time in rotor swept volume (seconds)	0			
Time for bird to transit rotors (seconds)	0.47032967			
Number of transits	0			
Probability of collision (Band model)	0.083503065			
Collisions during study period with 100 % operation and no avoidance	0			
Collisions during study period with 85 % operational rate and no avoidance	0			
SNH recommended avoidance rate	0.99			
Collisions during study period with 85 % operational rate with avoidance	0			

Strathy South, polygon 1: non-directional CRA summary for HH, Raptor breeding 2004, (2004-03-16 to 2004-08-31; 169 days)				
Turbine model	REpower-3.4-M104			
Hub height	83			
Rotor diameter	104			
Blade maximum chord	3.8			
Rotation speed	13.8			
Blade pitch	10			
Number of turbines	3			
Layout name	polygon 1			
Vantage point	1	2	3	4
Observed time (hours)	29.5	27	27	26
Area of windfarm visible within viewshed (km^2)	0.224208	0	0	0
Effort at each VP (time * area)	6.614136	0	0	0
Proportion of effort at each VP	1	0	0	0
Number of flights observed at PCH	1	0	0	0
Seconds of bird activity observed at PCH	3.626699924	0	0	0
Rate of bird activity (seconds per hour per km^2)	0.548325575	0	0	
Rate of bird activity weighted for effort (seconds per hour per km^2)	0.548325575	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	0.548325575			
Turbine area (convex hull buffered by radius; km^2)	0.295794			
Risk volume (m^3)	30762576			
Number of turbines	3			
Rotor swept volume (m^3)	109074.0863			
Vr/Vw	0.003545675			
Daylight during analysis period (hours)	2718.877221			
Estimated bird time in risk volume (seconds)	440.978544			
Estimated bird time in rotor swept volume (seconds)	1.563566451			
Time for bird to transit rotors (seconds)	0.47032967			
Number of transits	3.324405304			
Probability of collision (Band model)	0.083503065			
Collisions during study period with 100 % operation and no avoidance	0.277598031			
Collisions during study period with 85 % operational rate and no avoidance	0.235958326			
SNH recommended avoidance rate	0.99			
Collisions during study period with 85 % operational rate with avoidance	0.002359583			

Strathy South, polygon 2: non-directional CRA summary for HH, Raptor breeding 2004, (2004-03-16 to 2004-08-31; 169 days)				
Turbine model	REpower-3.4-M104			
Hub height	83			
Rotor diameter	104			
Blade maximum chord	3.8			
Rotation speed	13.8			
Blade pitch	10			
Number of turbines	9			
Layout name	polygon 2			
Vantage point	1	2	3	4
Observed time (hours)	29.5	27	27	26
Area of windfarm visible within viewshed (km^2)	0	1.20789	0	1.158
Effort at each VP (time * area)	0	32.61303	0	30.1093
Proportion of effort at each VP	0	0.519958841	0	0.480041159
Number of flights observed at PCH	0	2	0	1
Seconds of bird activity observed at PCH	0	28.42730045	0	59.24530029
Rate of bird activity (seconds per hour per km^2)	0	0.871654687	0	1.967674449
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0.453224561	0	0.944564723
Total weighted rate of bird activity (seconds per hour per km^2)	1.397789284			
Turbine area (convex hull buffered by radius; km^2)	1.28404			
Risk volume (m^3)	133540160			
Number of turbines	9			
Rotor swept volume (m^3)	327222.2589			
Vr/Vw	0.002450366			
Daylight during analysis period (hours)	2718.877221			
Estimated bird time in risk volume (seconds)	4879.888015			
Estimated bird time in rotor swept volume (seconds)	11.95751136			
Time for bird to transit rotors (seconds)	0.47032967			
Number of transits	25.42368069			
Probability of collision (Band model)	0.083503065			
Collisions during study period with 100 % operation and no avoidance	2.122955253			
Collisions during study period with 85 % operational rate and no avoidance	1.804511965			
SNH recommended avoidance rate	0.99			
Collisions during study period with 85 % operational rate with avoidance	0.01804512			

Strathy South, polygon 3: non-directional CRA summary for HH, Raptor breeding 2004, (2004-03-16 to 2004-08-31; 169 days)				
Turbine model	REpower-3.4-M104			
Hub height	83			
Rotor diameter	104			
Blade maximum chord	3.8			
Rotation speed	13.8			
Blade pitch	10			
Number of turbines	27			
Layout name	polygon 3			
Vantage point	1	2	3	4
Observed time (hours)	29.5	27	27	26
Area of windfarm visible within viewshed (km^2)	0	0.48401	2.66443	0.77692
Effort at each VP (time * area)	0	13.06827	71.93961	20.20015
Proportion of effort at each VP	0	0.124213613	0.683784377	0.19200201
Number of flights observed at PCH	0	2	0	3
Seconds of bird activity observed at PCH	0	41.34211922	0	40.81091952
Rate of bird activity (seconds per hour per km^2)	0	3.163549515	0	2.020327148
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0.392955915	0	0.387906873
Total weighted rate of bird activity (seconds per hour per km^2)	0.780862788			
Turbine area (convex hull buffered by radius; km^2)	5.39904			
Risk volume (m^3)	561500160			
Number of turbines	27			
Rotor swept volume (m^3)	981666.7768			
Vr/Vw	0.001748293			
Daylight during analysis period (hours)	2718.877221			
Estimated bird time in risk volume (seconds)	11462.54011			
Estimated bird time in rotor swept volume (seconds)	20.03987817			
Time for bird to transit rotors (seconds)	0.47032967			
Number of transits	42.60815219			
Probability of collision (Band model)	0.083503065			
Collisions during study period with 100 % operation and no avoidance	3.557911288			
Collisions during study period with 85 % operational rate and no avoidance	3.024224594			
SNH recommended avoidance rate	0.99			
Collisions during study period with 85 % operational rate with avoidance	0.030242246			

Strathy South, polygon 1: non-directional CRA summary for HH, Raptor breeding, (2007-03-16 to 2007-08-31; 169 days)						
Turbine model	REpower-3.4-M104					
Hub height	83					
Rotor diameter	104					
Blade maximum chord	3.8					
Rotation speed	13.8					
Blade pitch	10					
Number of turbines	3					
Layout name	polygon 1					
Vantage point	1	2	3	4	5	6
Observed time (hours)	63	53.91666667	61.08333333	58.91666667	22.5	23
Area of windfarm visible within viewshed (km^2)	0.057508199	0	0	0	0	0.062358102
Effort at each VP (time * area)	3.623016551	0	0	0	0	1.434236336
Proportion of effort at each VP	0.716400115	0	0	0	0	0.283599885
Number of flights observed at PCH	1	0	0	0	0	0
Seconds of bird activity observed at PCH	14.66180038	0	0	0	0	0
Rate of bird activity (seconds per hour per km^2)	4.046848856	0	0	0	0	0
Rate of bird activity weighted for effort (seconds per hour per km^2)	2.899162987	0	0	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	2.899162987					
Turbine area (convex hull buffered by radius; km^2)	0.295794					
Risk volume (m^3)	30762576					
Number of turbines	3					
Rotor swept volume (m^3)	109074.0863					
Vr/Vw	0.003545675					
Daylight during analysis period (hours)	2716.522621					
Estimated bird time in risk volume (seconds)	2329.567601					
Estimated bird time in rotor swept volume (seconds)	8.259888821					
Time for bird to transit rotors (seconds)	0.47032967					
Number of transits	17.56191315					
Probability of collision (Band model)	0.083503065					
Collisions during study period with 100 % operation and no avoidance	1.466473569					
Collisions during study period with 85 % operational rate and no avoidance	1.246502534					
SNH recommended avoidance rate	0.99					
Collisions during study period with 85 % operational rate with avoidance	0.012465025					

Strathy South, polygon 2: non-directional CRA summary for HH, Raptor breeding, (2007-03-16 to 2007-08-31; 169 days)						
Turbine model	REpower-3.4-M104					
Hub height	83					
Rotor diameter	104					
Blade maximum chord	3.8					
Rotation speed	13.8					
Blade pitch	10					
Number of turbines	9					
Layout name	polygon 2					
Vantage point	1	2	3	4	5	6
Observed time (hours)	63	53.91666667	61.08333333	58.91666667	22.5	23
Area of windfarm visible within viewshed (km^2)	0	0.073916	0	1.21384	0	0
Effort at each VP (time * area)	0	3.985304333	0	71.51540667	0	0
Proportion of effort at each VP	0	0.052784991	0	0.947215009	0	0
Number of flights observed at PCH	0	1	0	0	0	0
Seconds of bird activity observed at PCH	0	21.37170029	0	0	0	0
Rate of bird activity (seconds per hour per km^2)	0	5.362626916	0	0	0	
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0.283066212	0	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	0.283066212					
Turbine area (convex hull buffered by radius; km^2)	1.28404					
Risk volume (m^3)	133540160					
Number of turbines	9					
Rotor swept volume (m^3)	327222.2589					
Vr/Vw	0.002450366					
Daylight during analysis period (hours)	2716.522621					
Estimated bird time in risk volume (seconds)	987.3699654					
Estimated bird time in rotor swept volume (seconds)	2.419417728					
Time for bird to transit rotors (seconds)	0.47032967					
Number of transits	5.144089094					
Probability of collision (Band model)	0.083503065					
Collisions during study period with 100 % operation and no avoidance	0.429547204					
Collisions during study period with 85 % operational rate and no avoidance	0.365115124					
SNH recommended avoidance rate	0.99					
Collisions during study period with 85 % operational rate with avoidance	0.003651151					

Strathy South, polygon 3: non-directional CRA summary for HH, Raptor breeding, (2007-03-16 to 2007-08-31; 169 days)						
Turbine model	REpower-3.4-M104					
Hub height	83					
Rotor diameter	104					
Blade maximum chord	3.8					
Rotation speed	13.8					
Blade pitch	10					
Number of turbines	27					
Layout name	polygon 3					
Vantage point	1	2	3	4	5	6
Observed time (hours)	63	53.91666667	61.08333333	58.91666667	22.5	23
Area of windfarm visible within viewshed (km^2)	0	0.645167	2.66068	0.045984602	2.47413	0.085416797
Effort at each VP (time * area)	0	34.78525408	162.5232033	2.709259442	55.667925	1.964586328
Proportion of effort at each VP	0	0.135009599	0.630790062	0.010515261	0.216060065	0.007625013
Number of flights observed at PCH	0	5	2	0	0	0
Seconds of bird activity observed at PCH	0	249.6869135	164.4759979	0	0	0
Rate of bird activity (seconds per hour per km^2)	0	7.177952844	1.012015482	0	0	0
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0.969092538	0.638369308	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	1.607461846					
Turbine area (convex hull buffered by radius; km^2)	5.39904					
Risk volume (m^3)	561500160					
Number of turbines	27					
Rotor swept volume (m^3)	981666.7768					
Vr/Vw	0.001748293					
Daylight during analysis period (hours)	2716.522621					
Estimated bird time in risk volume (seconds)	23576.02288					
Estimated bird time in rotor swept volume (seconds)	41.21779483					
Time for bird to transit rotors (seconds)	0.47032967					
Number of transits	87.63596565					
Probability of collision (Band model)	0.083503065					
Collisions during study period with 100 % operation and no avoidance	7.317871707					
Collisions during study period with 85 % operational rate and no avoidance	6.220190951					
SNH recommended avoidance rate	0.99					
Collisions during study period with 85 % operational rate with avoidance	0.06220191					

Strathy South, polygon 1: directional CRA summary for RH, Diver breeding (2007-05-01 to 2007-09-15; 138 days)						
Turbine model	REpower-3.4-M104					
Hub height	83					
Rotor diameter	104					
Blade maximum chord	3.8					
Rotation speed	13.8					
Blade pitch	10					
Number of turbines	3					
Layout name	polygon 1					
Vantage point	1	2	3	4	5	6
Number of flights observed at PCH	1	0	0	0	0	0
Number of birds observed within windfarm at risk height	1	0	0	0	0	0
Observed time (hours)	60	47.91666667	58.08333333	52.91666667	28.5	27
Area of windfarm visible within viewshed (km^2)	0.057508199	0	0	0	0	0.062358102
Effort at each VP (time * area)	3.450491953	0	0	0	0	1.683668742
Proportion of effort at each VP	0.672065437	0	0	0	0	0.327934563
Rate of birds per hour per km^2	0.289813746	0	0	0	0	0
Rate of birds per hour per km^2 weighted for effort	0.194773802	0	0	0	0	0
Overall rate (birds per hour per km^2)	0.194773802					
Turbine area (convex hull buffered by radius; km^2)	0.295794					
Risk window length (m))	739.8480379					
Risk window height (m))	104					
Area of risk window (m^2))	76944.19594					
Rotor swept area (m^2)	25484.59961					
Potentially active hours (daylight plus 25 % of night hours)	2545.540569					
Predicted number of birds flying through risk window during period	146.6560304					
Flights transiting rotors during period	48.57377699					
Probability of collision (Band model)	0.069791307					
Collisions during study period with 100 % operation and no avoidance	3.390027376					
Collisions during study period with 85 % operational rate and no avoidance	2.88152327					
SNH recommended avoidance rate	0.98					
Collisions during study period with 85 % operational rate with avoidance	0.057630465					

Strathy South, polygon 2: directional CRA summary for RH, Diver breeding (2007-05-01 to 2007-09-15; 138 days)						
Turbine model	REpower-3.4-M104					
Hub height	83					
Rotor diameter	104					
Blade maximum chord	3.8					
Rotation speed	13.8					
Blade pitch	10					
Number of turbines	9					
Layout name	polygon 2					
Vantage point	1	2	3	4	5	6
Number of flights observed at PCH	0	0	0	1	0	0
Number of birds observed within windfarm at risk height	0	0	0	1	0	0
Observed time (hours)	60	47.91666667	58.08333333	52.91666667	28.5	27
Area of windfarm visible within viewshed (km^2)	0	0.073916	0	1.21384	0	0
Effort at each VP (time * area)	0	3.541808333	0	64.23236667	0	0
Proportion of effort at each VP	0	0.052258966	0	0.947741034	0	0
Rate of birds per hour per km^2	0	0	0	0.015568475	0	
Rate of birds per hour per km^2 weighted for effort	0	0	0	0.014754883	0	0
Overall rate (birds per hour per km^2)	0.014754883					
Turbine area (convex hull buffered by radius; km^2)	1.28404					
Risk window length (m))	1537.111047					
Risk window height (m))	104					
Area of risk window (m^2))	159859.5489					
Rotor swept area (m^2)	76453.79882					
Potentially active hours (daylight plus 25 % of night hours)	2545.540569					
Predicted number of birds flying through risk window during period	48.22745407					
Flights transiting rotors during period	23.06507241					
Probability of collision (Band model)	0.069791307					
Collisions during study period with 100 % operation and no avoidance	1.609741547					
Collisions during study period with 85 % operational rate and no avoidance	1.368280315					
SNH recommended avoidance rate	0.98					
Collisions during study period with 85 % operational rate with avoidance	0.027365606					

Strathy South, polygon 3: directional CRA summary for RH, Diver breeding (2007-05-01 to 2007-09-15; 138 days)						
Turbine model	REpower-3.4-M104					
Hub height	83					
Rotor diameter	104					
Blade maximum chord	3.8					
Rotation speed	13.8					
Blade pitch	10					
Number of turbines	27					
Layout name	polygon 3					
Vantage point	1	2	3	4	5	6
Number of flights observed at PCH	0	0	0	0	0	0
Number of birds observed within windfarm at risk height	0	0	0	0	0	0
Observed time (hours)	60	47.91666667	58.08333333	52.91666667	28.5	27
Area of windfarm visible within viewshed (km^2)	0	0.645167	2.66068	0.045984602	2.47413	0.085416797
Effort at each VP (time * area)	0	30.91425208	154.5411633	2.433351833	70.512705	2.306253516
Proportion of effort at each VP	0	0.118578197	0.592775542	0.009333639	0.270466496	0.008846126
Rate of birds per hour per km^2	0	0	0	0	0	0
Rate of birds per hour per km^2 weighted for effort	0	0	0	0	0	0
Overall rate (birds per hour per km^2)	0					
Turbine area (convex hull buffered by radius; km^2)	5.39904					
Risk window length (m))	3979.046247					
Risk window height (m))	104					
Area of risk window (m^2))	413820.8097					
Rotor swept area (m^2)	229361.3965					
Potentially active hours (daylight plus 25 % of night hours)	2545.540569					
Predicted number of birds flying through risk window during period	0					
Flights transiting rotors during period	0					
Probability of collision (Band model)	0.069791307					
Collisions during study period with 100 % operation and no avoidance	0					
Collisions during study period with 85 % operational rate and no avoidance	0					
SNH recommended avoidance rate	0.98					
Collisions during study period with 85 % operational rate with avoidance	0					

Strathy South, polygon 1: non-directional CRA summary for HH, Raptor breeding, (2010-03-16 to 2010-08-31; 169 days)						
Turbine model	REpower-3.4-M104					
Hub height	83					
Rotor diameter	104					
Blade maximum chord	3.8					
Rotation speed	13.8					
Blade pitch	10					
Number of turbines	3					
Layout name	polygon 1					
Vantage point	1	2	3	4	5	6
Observed time (hours)	54.5	60	61	57	62	57
Area of windfarm visible within viewshed (km^2)	0.057508199	0	0	0	0	0.062358102
Effort at each VP (time * area)	3.134196857	0	0	0	0	3.554411789
Proportion of effort at each VP	0.468587269	0	0	0	0	0.531412731
Number of flights observed at PCH	1	2	0	0	0	3
Seconds of bird activity observed at PCH	9.250929832	16.38997984	0	0	0	75.38965893
Rate of bird activity (seconds per hour per km^2)	2.951610972	0	0	0	0	21.21016455
Rate of bird activity weighted for effort (seconds per hour per km^2)	1.383087324	0	0	0	0	11.27135147
Total weighted rate of bird activity (seconds per hour per km^2)	12.6544388					
Turbine area (convex hull buffered by radius; km^2)	0.295794					
Risk volume (m^3)	30762576					
Number of turbines	3					
Rotor swept volume (m^3)	109074.0863					
Vr/Vw	0.003545675					
Daylight during analysis period (hours)	2716.522621					
Estimated bird time in risk volume (seconds)	10168.23503					
Estimated bird time in rotor swept volume (seconds)	36.05325331					
Time for bird to transit rotors (seconds)	0.47032967					
Number of transits	76.65528157					
Probability of collision (Band model)	0.083503065					
Collisions during study period with 100 % operation and no avoidance	6.400950934					
Collisions during study period with 85 % operational rate and no avoidance	5.440808294					
SNH recommended avoidance rate	0.99					
Collisions during study period with 85 % operational rate with avoidance	0.054408083					

Strathy South, polygon 2: non-directional CRA summary for HH, Raptor breeding, (2010-03-16 to 2010-08-31; 169 days)						
Turbine model	REpower-3.4-M104					
Hub height	83					
Rotor diameter	104					
Blade maximum chord	3.8					
Rotation speed	13.8					
Blade pitch	10					
Number of turbines	9					
Layout name	polygon 2					
Vantage point	1	2	3	4	5	6
Observed time (hours)	54.5	60	61	57	62	57
Area of windfarm visible within viewshed (km^2)	0	0.073916	0	1.21384	0	0
Effort at each VP (time * area)	0	4.43496	0	69.18888	0	0
Proportion of effort at each VP	0	0.060238097	0	0.939761903	0	0
Number of flights observed at PCH	0	0	0	0	0	0
Seconds of bird activity observed at PCH	0	0	0	0	0	0
Rate of bird activity (seconds per hour per km^2)	0	0	0	0	0	
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	0					
Turbine area (convex hull buffered by radius; km^2)	1.28404					
Risk volume (m^3)	133540160					
Number of turbines	9					
Rotor swept volume (m^3)	327222.2589					
Vr/Vw	0.002450366					
Daylight during analysis period (hours)	2716.522621					
Estimated bird time in risk volume (seconds)	0					
Estimated bird time in rotor swept volume (seconds)	0					
Time for bird to transit rotors (seconds)	0.47032967					
Number of transits	0					
Probability of collision (Band model)	0.083503065					
Collisions during study period with 100 % operation and no avoidance	0					
Collisions during study period with 85 % operational rate and no avoidance	0					
SNH recommended avoidance rate	0.99					
Collisions during study period with 85 % operational rate with avoidance	0					

Strathy South, polygon 3: non-directional CRA summary for HH, Raptor breeding, (2010-03-16 to 2010-08-31; 169 days)						
Turbine model	REpower-3.4-M104					
Hub height	83					
Rotor diameter	104					
Blade maximum chord	3.8					
Rotation speed	13.8					
Blade pitch	10					
Number of turbines	27					
Layout name	polygon 3					
Vantage point	1	2	3	4	5	6
Observed time (hours)	54.5	60	61	57	62	57
Area of windfarm visible within viewshed (km^2)	0	0.645167	2.66068	0.045984602	2.47413	0.085416797
Effort at each VP (time * area)	0	38.71002	162.30148	2.621122289	153.39606	4.868757422
Proportion of effort at each VP	0	0.106964062	0.448473689	0.007242721	0.42386611	0.013453418
Number of flights observed at PCH	0	1	1	0	1	2
Seconds of bird activity observed at PCH	0	4.475649834	19.97159958	0	118.6549988	44.61843181
Rate of bird activity (seconds per hour per km^2)	0	0.115619931	0.12305248	0	0.773520511	9.164233898
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0.012367177	0.0551858	0	0.32786913	0.123290267
Total weighted rate of bird activity (seconds per hour per km^2)	0.518712374					
Turbine area (convex hull buffered by radius; km^2)	5.39904					
Risk volume (m^3)	561500160					
Number of turbines	27					
Rotor swept volume (m^3)	981666.7768					
Vr/Vw	0.001748293					
Daylight during analysis period (hours)	2716.522621					
Estimated bird time in risk volume (seconds)	7607.754313					
Estimated bird time in rotor swept volume (seconds)	13.30058331					
Time for bird to transit rotors (seconds)	0.47032967					
Number of transits	28.27927759					
Probability of collision (Band model)	0.083503065					
Collisions during study period with 100 % operation and no avoidance	2.361406346					
Collisions during study period with 85 % operational rate and no avoidance	2.007195394					
SNH recommended avoidance rate	0.99					
Collisions during study period with 85 % operational rate with avoidance	0.020071954					

Strathy South, polygon 1: non-directional CRA summary for HH, Raptor non-breeding, (2009-09-01 to 2010-03-15; 196 days)						
Turbine model	REpower-3.4-M104					
Hub height	83					
Rotor diameter	104					
Blade maximum chord	3.8					
Rotation speed	13.8					
Blade pitch	10					
Number of turbines	3					
Layout name	polygon 1					
Vantage point	1	2	3	4	5	6
Observed time (hours)	28.5	28.5	25.33333333	22	23	34
Area of windfarm visible within viewshed (km^2)	0.057508199	0	0	0	0	0.062358102
Effort at each VP (time * area)	1.638983678	0	0	0	0	2.120175453
Proportion of effort at each VP	0.435997419	0	0	0	0	0.564002581
Number of flights observed at PCH	0	0	0	0	0	0
Seconds of bird activity observed at PCH	0	0	0	0	0	0
Rate of bird activity (seconds per hour per km^2)	0	0	0	0	0	0
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	0					
Turbine area (convex hull buffered by radius; km^2)	0.295794					
Risk volume (m^3)	30762576					
Number of turbines	3					
Rotor swept volume (m^3)	109074.0863					
Vr/Vw	0.003545675					
Daylight during analysis period (hours)	1794.17412					
Estimated bird time in risk volume (seconds)	0					
Estimated bird time in rotor swept volume (seconds)	0					
Time for bird to transit rotors (seconds)	0.47032967					
Number of transits	0					
Probability of collision (Band model)	0.083503065					
Collisions during study period with 100 % operation and no avoidance	0					
Collisions during study period with 85 % operational rate and no avoidance	0					
SNH recommended avoidance rate	0.99					
Collisions during study period with 85 % operational rate with avoidance	0					

Strathy South, polygon 2: non-directional CRA summary for HH, Raptor non-breeding, (2009-09-01 to 2010-03-15; 196 days)						
Turbine model	REpower-3.4-M104					
Hub height	83					
Rotor diameter	104					
Blade maximum chord	3.8					
Rotation speed	13.8					
Blade pitch	10					
Number of turbines	9					
Layout name	polygon 2					
Vantage point	1	2	3	4	5	6
Observed time (hours)	28.5	28.5	25.33333333	22	23	34
Area of windfarm visible within viewshed (km^2)	0	0.073916	0	1.21384	0	0
Effort at each VP (time * area)	0	2.106606	0	26.70448	0	0
Proportion of effort at each VP	0	0.073117896	0	0.926882104	0	0
Number of flights observed at PCH	0	0	0	0	0	0
Seconds of bird activity observed at PCH	0	0	0	0	0	0
Rate of bird activity (seconds per hour per km^2)	0	0	0	0	0	
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	0					
Turbine area (convex hull buffered by radius; km^2)	1.28404					
Risk volume (m^3)	133540160					
Number of turbines	9					
Rotor swept volume (m^3)	327222.2589					
Vr/Vw	0.002450366					
Daylight during analysis period (hours)	1794.17412					
Estimated bird time in risk volume (seconds)	0					
Estimated bird time in rotor swept volume (seconds)	0					
Time for bird to transit rotors (seconds)	0.47032967					
Number of transits	0					
Probability of collision (Band model)	0.083503065					
Collisions during study period with 100 % operation and no avoidance	0					
Collisions during study period with 85 % operational rate and no avoidance	0					
SNH recommended avoidance rate	0.99					
Collisions during study period with 85 % operational rate with avoidance	0					

Strathy South, polygon 3: non-directional CRA summary for HH, Raptor non-breeding, (2009-09-01 to 2010-03-15; 196 days)						
Turbine model	REpower-3.4-M104					
Hub height	83					
Rotor diameter	104					
Blade maximum chord	3.8					
Rotation speed	13.8					
Blade pitch	10					
Number of turbines	27					
Layout name	polygon 3					
Vantage point	1	2	3	4	5	6
Observed time (hours)	28.5	28.5	25.33333333	22	23	34
Area of windfarm visible within viewshed (km^2)	0	0.645167	2.66068	0.045984602	2.47413	0.085416797
Effort at each VP (time * area)	0	18.3872595	67.40389333	1.011661234	56.90499	2.904171094
Proportion of effort at each VP	0	0.125414445	0.459743437	0.006900263	0.388133302	0.019808553
Number of flights observed at PCH	0	0	0	0	0	0
Seconds of bird activity observed at PCH	0	0	0	0	0	0
Rate of bird activity (seconds per hour per km^2)	0	0	0	0	0	0
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	0					
Turbine area (convex hull buffered by radius; km^2)	5.39904					
Risk volume (m^3)	561500160					
Number of turbines	27					
Rotor swept volume (m^3)	981666.7768					
Vr/Vw	0.001748293					
Daylight during analysis period (hours)	1794.17412					
Estimated bird time in risk volume (seconds)	0					
Estimated bird time in rotor swept volume (seconds)	0					
Time for bird to transit rotors (seconds)	0.47032967					
Number of transits	0					
Probability of collision (Band model)	0.083503065					
Collisions during study period with 100 % operation and no avoidance	0					
Collisions during study period with 85 % operational rate and no avoidance	0					
SNH recommended avoidance rate	0.99					
Collisions during study period with 85 % operational rate with avoidance	0					

Strathy South, polygon 1: non-directional CRA summary for HH, Raptor breeding, (2012-03-16 to 2012-08-31; 169 days)								
Turbine model	REpower-3.4-M104							
Hub height	83							
Rotor diameter	104							
Blade maximum chord	3.8							
Rotation speed	13.8							
Blade pitch	10							
Number of turbines	3							
Layout name	polygon 1							
Vantage point	3	15	16	17	18	19	20	21
Observed time (hours)	69	57	57	69	66	60	60	58
Area of windfarm visible within viewshed (km^2)	0	0.157429	0.295794	0	0	0	0.070759797	0
Effort at each VP (time * area)	0	8.973453	16.860258	0	0	0	4.245587813	0
Proportion of effort at each VP	0	0.298326535	0.560526963	0	0	0	0.141146502	0
Number of flights observed at PCH	0	0	1	1	0	0	1	0
Seconds of bird activity observed at PCH	0	0	11.01949978	2.292129993	0	0	2.279530048	0
Rate of bird activity (seconds per hour per km^2)	0	0	0.65357836	0	0	0	0.536917419	
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0.366348293	0	0	0	0.075784016	0
Total weighted rate of bird activity (seconds per hour per km^2)	0.442132309							
Turbine area (convex hull buffered by radius; km^2)	0.295794							
Risk volume (m^3)	30762576							
Number of turbines	3							
Rotor swept volume (m^3)	109074.0863							
Vr/Vw	0.003545675							
Daylight during analysis period (hours)	2718.877221							
Estimated bird time in risk volume (seconds)	355.5749917							
Estimated bird time in rotor swept volume (seconds)	1.260753239							
Time for bird to transit rotors (seconds)	0.47032967							
Number of transits	2.680573475							
Probability of collision (Band model)	0.083503065							
Collisions during study period with 100 % operation and no avoidance	0.2238361							
Collisions during study period with 85 % operational rate and no avoidance	0.190260685							
SNH recommended avoidance rate	0.99							
Collisions during study period with 85 % operational rate with avoidance	0.001902607							

Strathy South, polygon 2: non-directional CRA summary for HH, Raptor breeding, (2012-03-16 to 2012-08-31; 169 days)								
Turbine model	REpower-3.4-M104							
Hub height	83							
Rotor diameter	104							
Blade maximum chord	3.8							
Rotation speed	13.8							
Blade pitch	10							
Number of turbines	9							
Layout name	polygon 2							
Vantage point	3	15	16	17	18	19	20	21
Observed time (hours)	69	57	57	69	66	60	60	58
Area of windfarm visible within viewshed (km^2)	0	0	0	0.696859	1.19628	0.11911	1.06187	0
Effort at each VP (time * area)	0	0	0	48.083271	78.95448	7.1466	63.7122	0
Proportion of effort at each VP	0	0	0	0.242971748	0.398968449	0.036112807	0.321946995	0
Number of flights observed at PCH	0	0	1	2	7	2	3	0
Seconds of bird activity observed at PCH	0	0	0.494439989	7.811949968	407.25	0.130079665	16.13522983	0
Rate of bird activity (seconds per hour per km^2)	0	0	0	0.162467108	5.158035364	0.018201615	0.253251808	
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0	0.039474917	2.057893369	0.000657311	0.081533659	0
Total weighted rate of bird activity (seconds per hour per km^2)	2.179559256							
Turbine area (convex hull buffered by radius; km^2)	1.28404							
Risk volume (m^3)	133540160							
Number of turbines	9							
Rotor swept volume (m^3)	327222.2589							
Vr/Vw	0.002450366							
Daylight during analysis period (hours)	2718.877221							
Estimated bird time in risk volume (seconds)	7609.161991							
Estimated bird time in rotor swept volume (seconds)	18.64523133							
Time for bird to transit rotors (seconds)	0.47032967							
Number of transits	39.64289839							
Probability of collision (Band model)	0.083503065							
Collisions during study period with 100 % operation and no avoidance	3.310303508							
Collisions during study period with 85 % operational rate and no avoidance	2.813757982							
SNH recommended avoidance rate	0.99							
Collisions during study period with 85 % operational rate with avoidance	0.02813758							

Strathy South, polygon 3: non-directional CRA summary for HH, Raptor breeding, (2012-03-16 to 2012-08-31; 169 days)								
Turbine model	REpower-3.4-M104							
Hub height	83							
Rotor diameter	104							
Blade maximum chord	3.8							
Rotation speed	13.8							
Blade pitch	10							
Number of turbines	27							
Layout name	polygon 3							
Vantage point	3	15	16	17	18	19	20	21
Observed time (hours)	69	57	57	69	66	60	60	58
Area of windfarm visible within viewshed (km^2)	2.66068	0	0.201758	0	0.7605	2.16567	0.232834	2.427
Effort at each VP (time * area)	183.58692	0	11.500206	0	50.193	129.9402	13.97004	140.7694
Proportion of effort at each VP	0.34641666	0	0.021700146	0	0.094710949	0.245188765	0.026360563	0.265622917
Number of flights observed at PCH	5	0	4	0	3	6	1	8
Seconds of bird activity observed at PCH	439.2436943	0	117.7856293	0	121.1882	203.358798	0.59907198	337.9523315
Rate of bird activity (seconds per hour per km^2)	2.3925653	0	10.24204517	0	2.414444245	1.565018355	0.042882624	2.400750017
Rate of bird activity weighted for effort (seconds per hour per km^2)	0.828824481	0	0.222253875	0	0.228674306	0.383724917	0.00113041	0.637694222
Total weighted rate of bird activity (seconds per hour per km^2)	2.302302211							
Turbine area (convex hull buffered by radius; km^2)	5.39904							
Risk volume (m^3)	561500160							
Number of turbines	27							
Rotor swept volume (m^3)	981666.7768							
Vr/Vw	0.001748293							
Daylight during analysis period (hours)	2718.877221							
Estimated bird time in risk volume (seconds)	33796.24671							
Estimated bird time in rotor swept volume (seconds)	59.0857402							
Time for bird to transit rotors (seconds)	0.47032967							
Number of transits	125.6262233							
Probability of collision (Band model)	0.083503065							
Collisions during study period with 100 % operation and no avoidance	10.49017465							
Collisions during study period with 85 % operational rate and no avoidance	8.916648453							
SNH recommended avoidance rate	0.99							
Collisions during study period with 85 % operational rate with avoidance	0.089166485							

Strathy South, polygon 1: non-directional CRA summary for HH, Raptor non-breeding, (2011-09-01 to 2012-03-15; 197 days)								
Turbine model	REpower-3.4-M104							
Hub height	83							
Rotor diameter	104							
Blade maximum chord	3.8							
Rotation speed	13.8							
Blade pitch	10							
Number of turbines	3							
Layout name	polygon 1							
Vantage point	3	15	16	17	18	19	20	21
Observed time (hours)	3	3	3	3	3	3		
Area of windfarm visible within viewshed (km^2)	0	0.157429	0.295794	0	0	0	0.070759797	0
Effort at each VP (time * area)	0	0.472287	0.887382	0	0	0	0.212279391	0
Proportion of effort at each VP	0	0.300446887	0.5645109	0	0	0	0.135042214	0
Number of flights observed at PCH	0	0	0	0	0	0	0	0
Seconds of bird activity observed at PCH	0	0	0	0	0	0	0	0
Rate of bird activity (seconds per hour per km^2)	0	0	0	0	0	0	0	
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0	0	0	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	0							
Turbine area (convex hull buffered by radius; km^2)	0.295794							
Risk volume (m^3)	30762576							
Number of turbines	3							
Rotor swept volume (m^3)	109074.0863							
Vr/Vw	0.003545675							
Daylight during analysis period (hours)	1805.939418							
Estimated bird time in risk volume (seconds)	0							
Estimated bird time in rotor swept volume (seconds)	0							
Time for bird to transit rotors (seconds)	0.47032967							
Number of transits	0							
Probability of collision (Band model)	0.083503065							
Collisions during study period with 100 % operation and no avoidance	0							
Collisions during study period with 85 % operational rate and no avoidance	0							
SNH recommended avoidance rate	0.99							
Collisions during study period with 85 % operational rate with avoidance	0							

Strathy South, polygon 2: non-directional CRA summary for HH, Raptor non-breeding, (2011-09-01 to 2012-03-15; 197 days)								
Turbine model	REpower-3.4-M104							
Hub height	83							
Rotor diameter	104							
Blade maximum chord	3.8							
Rotation speed	13.8							
Blade pitch	10							
Number of turbines	9							
Layout name	polygon 2							
Vantage point	3	15	16	17	18	19	20	21
Observed time (hours)	3	3	3	3	3	3		
Area of windfarm visible within viewshed (km^2)	0	0	0	0.696859	1.19628	0.11911	1.06187	0
Effort at each VP (time * area)	0	0	0	2.090577	0	0	3.18561	0
Proportion of effort at each VP	0	0	0	0.396228754	0	0	0.603771246	0
Number of flights observed at PCH	0	0	0	0	0	0	0	0
Seconds of bird activity observed at PCH	0	0	0	0	0	0	0	0
Rate of bird activity (seconds per hour per km^2)	0	0	0	0	0	0	0	
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0	0	0	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	0							
Turbine area (convex hull buffered by radius; km^2)	1.28404							
Risk volume (m^3)	133540160							
Number of turbines	9							
Rotor swept volume (m^3)	327222.2589							
Vr/Vw	0.002450366							
Daylight during analysis period (hours)	1805.939418							
Estimated bird time in risk volume (seconds)	0							
Estimated bird time in rotor swept volume (seconds)	0							
Time for bird to transit rotors (seconds)	0.47032967							
Number of transits	0							
Probability of collision (Band model)	0.083503065							
Collisions during study period with 100 % operation and no avoidance	0							
Collisions during study period with 85 % operational rate and no avoidance	0							
SNH recommended avoidance rate	0.99							
Collisions during study period with 85 % operational rate with avoidance	0							

Strathy South, polygon 3: non-directional CRA summary for HH, Raptor non-breeding, (2011-09-01 to 2012-03-15; 197 days)								
Turbine model	REpower-3.4-M104							
Hub height	83							
Rotor diameter	104							
Blade maximum chord	3.8							
Rotation speed	13.8							
Blade pitch	10							
Number of turbines	27							
Layout name	polygon 3							
Vantage point	3	15	16	17	18	19	20	21
Observed time (hours)	3	3	3	3	3	3		
Area of windfarm visible within viewshed (km^2)	2.66068	0	0.201758	0	0.7605	2.16567	0.232834	2.427
Effort at each VP (time * area)	7.98204	0	0.605274	0	0	0	0.698502	7.2811
Proportion of effort at each VP	0.481803702	0	0.036535	0	0	0	0.042162	0.439499
Number of flights observed at PCH	0	0	0	0	0	0	0	0
Seconds of bird activity observed at PCH	0	0	0	0	0	0	0	0
Rate of bird activity (seconds per hour per km^2)	0	0	0	0	0	0	0	0
Rate of bird activity weighted for effort (seconds per hour per km^2)	0	0	0	0	0	0	0	0
Total weighted rate of bird activity (seconds per hour per km^2)	0	15	16	17	18	19	20	21
Turbine area (convex hull buffered by radius; km^2)	5.39904							
Risk volume (m^3)	561500160							
Number of turbines	27							
Rotor swept volume (m^3)	981666.7768							
Vr/Vw	0.001748293							
Daylight during analysis period (hours)	1805.939418							
Estimated bird time in risk volume (seconds)	0							
Estimated bird time in rotor swept volume (seconds)	0							
Time for bird to transit rotors (seconds)	0.47032967							
Number of transits	0							
Probability of collision (Band model)	0.083503065							
Collisions during study period with 100 % operation and no avoidance	0							
Collisions during study period with 85 % operational rate and no avoidance	0							
SNH recommended avoidance rate	0.99							
Collisions during study period with 85 % operational rate with avoidance	0							

Strathy South, polygon 1: directional CRA summary for RH, Diver breeding (2012-05-01 to 2012-09-15; 138 days)								
Turbine model	REpower-3.4-M104							
Hub height	83							
Rotor diameter	104							
Blade maximum chord	3.8							
Rotation speed	13.8							
Blade pitch	10							
Number of turbines	3							
Layout name	polygon 1							
Vantage point	3	15	16	17	18	19	20	21
Number of flights observed at PCH	0	0	0	4	0	0	0	0
Number of birds observed within windfarm at risk height	0	0	0	4	0	0	0	0
Observed time (hours)	57	48	48	60	54	48	54	48
Area of windfarm visible within viewshed (km^2)	0	0.157429	0.295794	0	0	0	0.070759797	0
Effort at each VP (time * area)	0	7.556592	14.198112	0	0	0	3.821029031	0
Proportion of effort at each VP	0	0.295459449	0.555139983	0	0	0	0.149400568	0
Rate of birds per hour per km^2	0	0	0	0	0	0	0	
Rate of birds per hour per km^2 weighted for effort	0	0	0	0	0	0	0	0
Overall rate (birds per hour per km^2)	0							
Turbine area (convex hull buffered by radius; km^2)	0.295794							
Risk window length (m))	739.8480379							
Risk window height (m))	104							
Area of risk window (m^2))	76944.19594							
Rotor swept area (m^2)	25484.59961							
Potentially active hours (daylight plus 25 % of night hours)	2543.446948							
Predicted number of birds flying through risk window during period	0							
Flights transiting rotors during period	0							
Probability of collision (Band model)	0.069791307							
Collisions during study period with 100 % operation and no avoidance	0							
Collisions during study period with 85 % operational rate and no avoidance	0							
SNH recommended avoidance rate	0.98							
Collisions during study period with 85 % operational rate with avoidance	0							

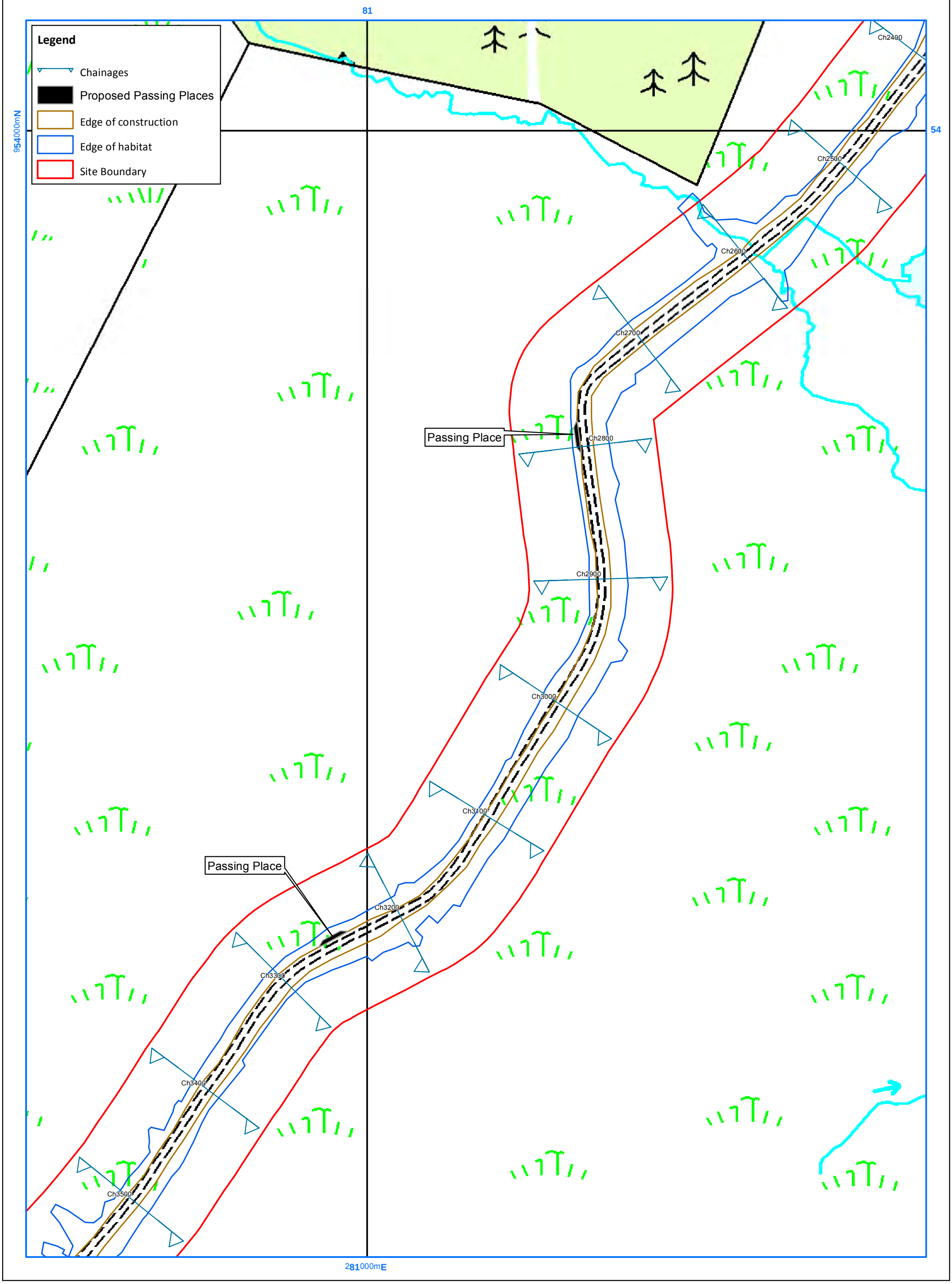
Strathy South, polygon 2: directional CRA summary for RH, Diver breeding (2012-05-01 to 2012-09-15; 138 days)								
Turbine model	REpower-3.4-M104							
Hub height	83							
Rotor diameter	104							
Blade maximum chord	3.8							
Rotation speed	13.8							
Blade pitch	10							
Number of turbines	9							
Layout name	polygon 2							
Vantage point	3	15	16	17	18	19	20	21
Number of flights observed at PCH	0	0	0	14	10	0	0	0
Number of birds observed within windfarm at risk height	0	0	0	15	12	0	0	0
Observed time (hours)	57	48	48	60	54	48	54	48
Area of windfarm visible within viewshed (km^2)	0	0	0	0.696859	1.19628	0.11911	1.06187	0
Effort at each VP (time * area)	0	0	0	41.81154	64.59912	5.71728	57.34098	0
Proportion of effort at each VP	0	0	0	0.246720992	0.381185647	0.033736451	0.338356909	0
Rate of birds per hour per km^2	0	0	0	0.358752631	0.185761044	0	0	
Rate of birds per hour per km^2 weighted for effort	0	0	0	0.088511805	0.070809444	0	0	0
Overall rate (birds per hour per km^2)	0.159321249							
Turbine area (convex hull buffered by radius; km^2)	1.28404							
Risk window length (m))	1537.111047							
Risk window height (m))	104							
Area of risk window (m^2))	159859.5489							
Rotor swept area (m^2)	76453.79882							
Potentially active hours (daylight plus 25 % of night hours)	2543.446948							
Predicted number of birds flying through risk window during period	520.3252946							
Flights transiting rotors during period	248.848728							
Probability of collision (Band model)	0.069791307							
Collisions during study period with 100 % operation and no avoidance	17.36747794							
Collisions during study period with 85 % operational rate and no avoidance	14.76235625							
SNH recommended avoidance rate	0.98							
Collisions during study period with 85 % operational rate with avoidance	0.295247125							

Strathy South, polygon 3: directional CRA summary for RH, Diver breeding (2012-05-01 to 2012-09-15; 138 days)								
Turbine model	REpower-3.4-M104							
Hub height	83							
Rotor diameter	104							
Blade maximum chord	3.8							
Rotation speed	13.8							
Blade pitch	10							
Number of turbines	27							
Layout name	polygon 3							
Vantage point	3	15	16	17	18	19	20	21
Number of flights observed at PCH	0	0	0	0	7	0	0	0
Number of birds observed within windfarm at risk height	0	0	0	0	8	0	0	0
Observed time (hours)	57	48	48	60	54	48	54	48
Area of windfarm visible within viewshed (km^2)	2.66068	0	0.201758	0	0.7605	2.16567	0.232834	2.427
Effort at each VP (time * area)	151.65876	0	9.684384	0	41.067	103.95216	12.573036	116.4988
Proportion of effort at each VP	0.348293159	0	0.022240751	0	0.094312753	0.238732179	0.028874708	0.267546
Rate of birds per hour per km^2	0	0	0	0	0.194803614	0	0	0
Rate of birds per hour per km^2 weighted for effort	0	0	0	0	0.018372465	0	0	0
Overall rate (birds per hour per km^2)	0.018372465							
Turbine area (convex hull buffered by radius; km^2)	5.39904							
Risk window length (m))	3979.046247							
Risk window height (m))	104							
Area of risk window (m^2))	413820.8097							
Rotor swept area (m^2)	229361.3965							
Potentially active hours (daylight plus 25 % of night hours)	2543.446948							
Predicted number of birds flying through risk window during period	252.293847							
Flights transiting rotors during period	139.8346041							
Probability of collision (Band model)	0.069791307							
Collisions during study period with 100 % operation and no avoidance	9.759239764							
Collisions during study period with 85 % operational rate and no avoidance	8.2953538							
SNH recommended avoidance rate	0.98							
Collisions during study period with 85 % operational rate with avoidance	0.165907076							

APPENDIX 3. ACCESS TRACK PASSING PLACES

BRITISH NATIONAL GRID / OSGB36

STRATHY NORTH-SOUTH ACCESS



1:2,500 @ A3

0 50 100 150 200 250 Meters

N

Produced by L Mills
SSE Renewables Developments (UK) Ltd
Dated: 02 Dec 13
Task No: STRATHY S_029_Proposed Passing Places

APPENDIX 4. PEAT STABILITY ASSESSMENT SLOPE PLANS

N
W E
S

NOTES

1. SLOPE CALCULATED USING OS PROFILE DTM

LEGEND

- SITE BOUNDARY
- TURBINE
- PERMANENT MET MASTS
- PROPOSED TRACK
- ACCESS ROUTE
- HARDSTANDINGS
- CONCRETE BATCHING PLANT
- CONSTRUCTION COMPOUND
- SWITCHING STATION
- LAY DOWN AREA
- BORROW PIT

SLOPE (DEGREES)

- 0 - 2
- 2 - 5
- 5 - 8
- 8 - 10
- 10 - 12
- > 12

SSE Renewables

SLR
4 THE ROUNDAL
RODDINGLAW BUSINESS
PARK, GOGAR
EDINBURGH, EH12 9DB
T: 0131 335 6830
F: 0131 335 6831
www.slrconsulting.com

STRATHY SOUTH WIND FARM

PEAT LANDSLIDE AND HAZARD RISK ASSESSMENT

SLOPE PLAN

4

Scale 1:25,000 @ A3

Date MAY 2013

0660.00018.9.4.0 Slope

N
W E
S

NOTES

1. SLOPE CALCULATED USING OS PROFILE DTM

LEGEND

- SITE BOUNDARY
- TURBINE
- PERMANENT MET MASTS
- PROPOSED TRACK
- ACCESS ROUTE
- WATER EXTRACTION POINTS
- WATER CROSSING
- Hardstandings
- CONCRETE BATCHING PLANT
- CONSTRUCTION COMPOUND
- SWITCHING STATION
- LAY DOWN AREA
- BORROW PIT SEARCH AREA
- BORROW PIT

SLOPE (DEGREES)

- 0 - 5
- 5 - 8
- 8 - 10
- 10 - 12
- >12

0660.00018.9.4.0 Slope

SSE Renewables

SLR
4 THE ROUNDAL
RODDINGLAW BUSINESS
PARK, GOGAR
EDINBURGH, EH12 9DB
T: 0131 335 6830
F: 0131 335 6831
www.slrconsulting.com

STRATHY SOUTH WIND FARM

PEAT STABILITY ASSESSMENT

SLOPE PLAN

4

Scale 1:25,000 @ A3

Date MAY 2013

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

Simon Zisman
RPS Planning & Development
Ocean Point One
4th Floor
94 Ocean Drive
Edinburgh
EH6 6JH

6 February 2014

Dear Simon,

Strathy South wind farm addendum – clarifications and associated up-dates

Thank you for your letter of 24 December 2013 for the proposed Strathy South wind farm.

We have reviewed the clarifications and up-dates and offer the following advice:

Caithness and Sutherland Peatlands SPA
a. Red-throated diver
We welcome the clarification of the collision risk modelling (CRM) process and a worked example of the CRM for red-throated diver. We also welcome clarification that no watches of seven hours were carried out.

However, we consider that the vantage point effort covering Loch 64 falls short of our recommendations. Our advice is that additional vantage point work to inform a robust assessment of flight activity rates and flight directions for Loch 64 should be carried out. We therefore maintain our objection.

b. Greenshank
We welcome the additional information on distance detection, but remain concerned that the apparent reduction in detectability at 0-250m compared with 250-500m may indicate that observer disturbance has occurred. This would make the modelling of detectability distances very difficult. We recommend that any corrections should be based on published approaches to this problem (e.g. Buckland et al 2001, Buckland et al 2007[1]).

We remain of the view that impacts to greenshank have not yet been adequately quantified. Given the apparent importance of Strathy South and adjoining land for this species, we consider it necessary that all records of greenshank from the 2010 and 2012 surveys are presented to enable consistent judgements on the status of the species within and around the development site. We also recommend that a more detailed analysis is carried out to clarify how territory centres were calculated.

[1] Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L. & Thomas, L. 2001. Introduction to Distance Sampling. OUP.
Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L. & Thomas, L. 2007. Advanced Distance Sampling. OUP.

The Links, Golspie Business Park, Golspie, Sutherland KW10 6UB
Tel 01408 634063 Fax 01408 634222 www.snh.org.uk
An Ceangal, Roan Gnìomhachais Ghoillspidh, Goillspidh, Cataibh, KW10 6UB
Fòn 01408 634063 Fax 01408 634222 www.snh.org.uk

We accept that defining territories and therefore breeding numbers for greenshank can be difficult. However, we find it difficult to relate decisions made about the territory locations based on the information provided in the ES. It is not clear what grid references refer to (e.g. are they putative territory centres or do all records for one grid reference really relate to multiple sightings at the same location). This is a problem because distances from turbines are calculated on these grid references, yet we are left unclear as what exactly the grid references (and mapped locations) actually refer to. Nor is it clear whether any reference has been made in making such decisions to Hancock (1997)[2], whereby a cut-off distance of 800m is applied to separate registrations for the 1995 survey as a means of defining separate territories. The lack of clarity makes it difficult to determine with confidence how many breeding pairs occur within the survey area.

Our position with respect to greenshank is maintained i.e. objection.

c. Golden eagle
We note that you consider the 3.5km buffer figure excessively precautionary. We also note that SSER do not consider it necessary to investigate the line of sight from this territory's eyries but will do so as a 'gesture of goodwill'.

Our position with respect to golden eagle is therefore maintained (i.e. objection) until we receive suitable supporting evidence to amend our advice.

d. Hen harrier
We welcome the clarification on flight heights and the more detailed presentation of collision risk analysis. We conclude that the proposal and cumulatively with other proposals, will not adversely affect the integrity of the site. We therefore withdraw our objection.

e. Black-throated diver
As SSER propose to delete turbines 55, 62, 63, 68, 73 and 74 we conclude that the proposal will not adversely affect the integrity of the site. We therefore withdraw our objection.

f. Wood sandpiper
As SSER propose to delete turbine 51 we conclude that the proposal will not adversely affect the integrity of the site. We therefore withdraw our objection.

Caithness and Sutherland Peatlands SAC
a. Blanket bog and wet heath habitats

i) Access track passing places.
We welcome the additional information regarding the location of these and acknowledge that they do not coincide with any SAC qualifying habitat. It is unlikely that the construction and operation of the passing places would have a significant effect on the qualifying interests of the site. We therefore withdraw our objection on this aspect of the proposal.

ii) Peat Landslide and Hazard Risk Assessment
We are pleased to note that there has been an independent review of the Peat Landslide and Hazard Risk Assessment. However, we have still not seen any evidence that the Caithness and Sutherland Peatlands SAC was identified as an environmental receptor or that the authors of the report (SLR) concluded that it was not at risk from peat slide. To help things move forward we request a statement from SLR or CH2M Hill confirming that the Caithness

[2] Hancock, M.H., Gibbons, D.W. & Thompson, P.S. 1997. The Status of breeding Greenshank *Tringa nebularia* in the United Kingdom in 1995. Bird Study 44: 290-302.

and Sutherland Peatlands SAC is not at risk from peat slide. Upon receipt of this we will be able to reconsider our position.

iii) Spoil heaps, cable laying, deer management plan
We welcome SSER's acceptance of the conditions proposed and therefore withdraw our objection on these aspects of the proposal.

b. Otter
We will reconsider our position with respect to otter once we have received the information referred to in the Peat Landslide and Hazard Risk Assessment section.

Please let Alexander Macdonald (Alexander.Macdonald@snh.gov.uk) know if you need further information or advice from us in relation to this proposal.

Yours sincerely,

David Mackay
Operations Manager
Northern Isles and North Highland

c.c Nicki Small, SSE
Gordon Brown, ECDU

RPS

Our Ref: SEC7232/SZ

E-mail: zismans@rpsgroup.com
Tel No: 0131 555 5011
Date: 17 February 2014

Alec McDonald
Scottish Natural Heritage
The Links, Golspie Business Park
Golspie, Sutherland
KW10 6UB

Dear Alec,

SSER RESPONSE TO SCOTTISH NATURAL HERITAGE'S 6TH FEBRUARY 2014 RESPONSE TO STRATHY SOUTH WIND FARM ADDENDUM

Thank you for recently providing SNH's latest letter on the Strathy South Wind Farm application (dated 6th February 2014). We welcome the progress on several important matters, notably the resolution of issues on the access track and hen harriers. This represents the culmination of a considerable amount of work and we appreciate the time SNH have spent considering the Addendum.

SSER remains committed to providing all remaining clarifications, and to this end we trust you have already received the letter from SLR on peat slide risk assessment in relation to the Caithness and Sutherland Special Area of Conservation.

We are now writing to provide the clarifications and further response to the remaining outstanding ornithological matters. The structure of our letter therefore reflects the species highlighted in your 6th February response, namely:-

1. Vantage point coverage of Loch ID64 in relation to red-throated divers;

2. Distance detection and territory interpretation in relation to greenshank; and

3. Buffer distance for golden eagle.

You will be aware the planning officer is keen that this matter is now brought before the April 2014 planning committee so we trust that the clarifications enclosed enable SNH to complete its assessment. Should you consider a meeting (or a conference call or video call) be helpful to bring any residual matters to a close, SSER remain committed to work quickly and efficiently with SNH staff to ensure all necessary clarifications are available.

1. Red-throated diver

We note that in your 6th February letter, you state that SNH:-

'*consider that the vantage point effort covering Loch 64 falls short of our recommendations. Our advice is that additional vantage point work to inform a robust assessment of flight activity rates and flight directions for Loch 64 should be carried out. We therefore maintain our objection'*.

We have considered this advice in relation to SNH recommendations, and re-examined the vantage point coverage and other survey coverage of this lochan and more widely the site as a whole. Our conclusions are that the vantage point (VP) and breeding diver survey effort covering Loch 64 and its environs has enabled a fully comprehensive assessment of breeding and flight activity to be carried out .

In this respect, we note that our 2003 to 2012 surveys at Strathy South span the publication of SNH guidance on bird survey methods at wind farms dated November 2005, 2010 and most recently in August 2013. Within these publications, the key recommendations are that survey coverage should:-

(i) in general, cover two years where sensitive species or designated sites are present;

(ii) that vantage point surveys should, in general, cover a minimum of 36 hours per season;

(iii) specifically for red-throated divers, in order to assess the risk of flight paths between breeding lochs and feeding areas at sea, at least 15 in-coming flights should be recorded to determine the dominant flight directions; and

(iv) also for divers, vantage point surveys should include surveys at dawn and dusk, which can be periods of peak flight activity.

In relation to (i) above, as set out in paras. 2.1.1 to 2.1.5, and 2.2.1 of ES Addendum Technical Appendix A11.1 (July 2013), we have generated a robust and comprehensive dataset on flight activity and flight directions, bases on five years' surveys, considerably beyond the recommended span of data collection. As well as desk study data that goes back to the early 1990s, fieldwork has comprised a combination of extensive standard vantage point surveys, diver-specific vantage point surveys, and diver breeding surveys (plus use of incidental records from other breeding bird surveys (breeding raptor, breeding wader, raptor and greenshank specific VP surveys)) that were undertaken at Strathy South (and buffers) in 2003, 2004, 2007, 2010 and 2012, and also for 2005 the breeding diver survey at the 2003 and 2004 breeding sites and along the formerly proposed Cnoc Meala track[1].

These Strathy South diver data have also been supplemented by additional significant contextual standard and diver vantage point and breeding diver surveys that cover potential flight routes and breeding sites to the north and north-east (for Strathy North and Strathy Wood). This important body of additional vantage point and breeding survey data provides flight path data for 2003, 2004, 2007, 2008, 2009, 2010, 20011 and 2013 (Tables A11.1.2 and A11.1.3). In addition, the vantage point and breeding surveys for the Strathy grid connection route in 2010 are of some further note, because the vantage point results were relevant to assessing foraging flights from the Strathy South area to Strathy Bay.

As well as this comprehensive body of diver data, it is also worth highlighting that interpretation and knowledge of breeding diver distribution, territory occupation, breeding success and foraging behaviour have also benefitted from the expertise of RPS team member, David Butterfield. David, who formerly worked for RSPB in North Scotland from 1994 before joining RPS in 2010, is one of Scotland's acknowledged specialist field surveyors for divers and brings particular expertise of their distribution and behaviour in the Flow Country.

Overall therefore, we conclude that the duration and range of surveys completed have enabled a fully robust knowledge of flight activity and behaviour for red-throated divers, and that the duration of survey work is substantially greater than recommended by SNH guidelines.

In relation to (ii) above, flight activity surveys comprised a combination of standard VP watches and diver-specific watches, in accordance with SNH guidance (2005, 2010 and 2013). Their purpose was to determine flight activity and flight distribution within and surrounding the proposed wind farm, in order to assess risk of collision and displacement during the breeding season (1st May to 15th September each year).

[1] In including the 2003 and 2004 data in our analysis, it is perhaps worth highlighting that we have followed the same instruction SNH provided for Strathy North.

RPS

3.
Alec McDonald
17 February 2014

Having reviewed the survey hours across all relevant vantage points (i.e. those covering air space that divers using Loch 64 would cross), our conclusion is that effort either is in accordance with SNH recommendations, or where hours do not reach the 36 hour minimum, there is clearly adjacent vantage point coverage that has ensured detection of flight activity across the air space birds would have to cross in order to get to or from Loch ID 64.

The viewsheds of the Strathy South standard vantage point surveys are shown in Figures A11.1.15, A11.1.17, A11.1.19, with the diver-specific ones given in Figures A11.1.21, A11.1.23, A11.1.25 and A11.1.27. These have been used to identify the vantage points with viewsheds that either fully encompass, partially encompass, or lie adjacent to Loch ID 64, or whose air space divers would need to cross flying in or out of Loch ID 64. Resulting details given in Table 1 below, including the duration (in brackets) of the vantage point surveys completed over the diver's May to September breeding season. These data are taken from Table A11.1.63 of the ES Addendum. Where there are no vantage points in the particular category, N/A is inserted.

TABLE 1: VIEWSHED COVERAGE OF LOCH ID 64

Year	VP Type (and relevant Figure Number)	VP/s Fully Encompassing Loch ID 64 (hrs)	VP/s Partially Encompassing Loch ID 64 (hrs)	VP/s Adjacent to Loch ID 64 (hrs)	VP/s Covering Air Space That Would Be Crossed By Divers Flying In or Out of Loch ID 64 (hrs)
2003	Standard VP (Figure A11.1.15)	VP4 (42 hrs 0 mins) (albeit the viewshed is near the viewshed's 2km limit and does not cover the air space below the rotor swept area i.e. <30m).	N/A	VP2 (42 hrs 0 mins) for flights to/from the southeast.	VP1 (45 hrs 0 mins) for flights to/from the northwest. The viewshed of VP3 (42 hrs 0 mins), although more distant, covered air space that was evidently crossed in 2012, but no flights were detected across this area in 2003.
	Diver VP	N/A	N/A	N/A	N/A
2004	Standard VP (Figure A11.1.15)	VP4 (18 hrs 0 mins) (with the same caveats as 2003).	N/A	VP2 (15 hrs 0 mins) for flights to/from the southeast.	VP1 (18 hrs 0 mins) for flights to/from the northwest. VP3 (18 hrs 0 mins) (as for above).
	Diver VP (Figure A11.1.23)	N/A	N/A	N/A	VP42 (15 hrs 0 mins) for flights to/from the northwest. VP43 (17 hrs 30 mins) for flights to/from the east.
2007	Standard VP (Figure A11.1.17)	VP4 (56 hrs 55 mins).	N/A	VP2 (52 hrs 55 mins) for flights to/from the east and southeast. VP6 (34 hrs 55 mins) for flights to/from the northeast. VP1 (58 hrs 30 mins) for flights to/from the northwest.	The viewshed of VP3 (58 hrs 35 mins), although more distant, covered air space that was evidently crossed in 2012, but no flights were detected across this area in 2007.

TABLE 1: VIEWSHED COVERAGE OF LOCH ID 64

Year	VP Type (and relevant Figure Number)	VP/s Fully Encompassing Loch ID 64 (hrs)	VP/s Partially Encompassing Loch ID 64 (hrs)	VP/s Adjacent to Loch ID 64 (hrs)	VP/s Covering Air Space That Would Be Crossed By Divers Flying In or Out of Loch ID 64 (hrs)
	Diver VP (Figure A11.1.23)	N/A	N/A	N/A	Complimenting VP3, VP10 (80 hrs 0 mins) covered air space that was evidently crossed in 2012, but no flights were detected across this area in 2007. VP7 (78 hrs 30 mins) for flights to/from the northwest. VP8 (78 hrs 45 mins) for flights to/from the northeast. VP9 (83 hrs 30 mins) for flights to/from the southwest and west.
2010	Standard VP (Figure A11.1.17)	VP4 (29 hrs 0 mins) (importantly though, note Diver VPs 9 and 13 below, as well as 11)	N/A	VP2 (34 hrs 0 mins) for flights to/from the east and southeast. VP6 (28 hrs 0 mins) for flights to/from the northeast. VP1 (24 hrs 0 mins) for flights to/from the northwest.	The viewshed of VP3 (29 hrs 0 mins), although more distant, covered air space that was evidently crossed in 2012, but no flights were detected across this area in 2010.
	Diver VP (Figure A11.1.25)	VP11 (18 hrs 0 mins) (note one clarification, regarding Table A11.1.63 – it gives 12 hrs vantage point coverage but this is incorrect, and results from the deducting 4 hours for each of the 2 instances where VP duration was erroneously entered as 7 hrs. Hence, excluding the 1 hr break, there was an additional 3 hr vantage point survey for each of the 2 watches.	N/A	N/A	Complimenting VP4 and VP11, VP9 (54 hrs 0 mins) and VP13 (47 hrs 0 mins) covered the adjoining air space to the southwest. By examining the 2010 flight lines for this part of the wind farm, it is evident that the lower level of vantage point hours for either VP4 or VP11 did certainly not lead to reduced numbers of flights being recorded from these directions. Instead, as is evident from the lack of flights recorded by diver VPs heading into or out of the windfarm, there was very limited flight activity that could conceivably involve birds flying to/from Loch ID 64.

TABLE 1: VIEWSHED COVERAGE OF LOCH ID 64

Year	VP Type (and relevant Figure Number)	VP/s Fully Encompassing Loch ID 64 (hrs)	VP/s Partially Encompassing Loch ID 64 (hrs)	VP/s Adjacent to Loch ID 64 (hrs)	VP/s Covering Air Space That Would Be Crossed By Divers Flying In or Out of Loch ID 64 (hrs)
					VP7 (27 hrs 0 mins) for flights to/from the northwest. VP8 (79 hrs 30 mins) for flights to/from the northeast.
2012	Standard VP (Figure A11.1.19)	VP17 (60 hrs 0 mins). VP20 (54 hrs 0 mins).	VP16 (48 hrs 0 mins), just reaching the northern side of the loch. (note that a typographic error has been noted in Table A11.1.63. The table gives a value of 45 hrs for the duration of surveys from this vantage point but it is 48 hrs, according to Table A11.1.59).	VP18 (54 hrs 0 mins) covers air space to the south and southwest.	VP15 (48 hrs 0 mins) for flights to/from the northwest. VP 19 (48 hrs 0 mins) for flights to/from the southeast. The viewshed of VP3 (57 hrs 0 mins), although more distant, covered air space that was evidently crossed in 2012.
	Diver VP (Figure A11.1.27)	VP11 (12 hrs 0 mins).	VP25 (6 hrs 0 mins).	N/A	VP13 (5 hrs 15 mins) for flights to/from the southwest. VP26 (54 hrs 0 mins) for flights to/from the northwest. VP24 (66 hrs 0 mins) for flights to/from the east.

Since a key requirement in relation to red-throated divers is to ensure survey cover potential flight paths to foraging areas at sea, it is also worth re-iterating that in addition to all the vantage point coverage and survey hours detailed in Table 1, there has also been considerable further survey covering Strathy North. The viewsheds completed for Strathy North therefore have also helped to consolidate the understanding of diver movements, and Strathy North flight line data are therefore also included in the regional summary figures for the Strathy South Addendum.

Finally in relation to duration of surveys, your letter of 20th November 2013 also referred to apparent discrepancies between tables A11.1.57 – A11.1.60 and A11.1.63. We are pleased to take the opportunity to clarify this point, as there was some mis-tabulations of non-standard vantage points incorrectly included in tables intended for standard vantage point surveys. Therefore, in Table A11.1.55, rows relating to VPs 7, 8, 9 and 10 should be ignored, as they are correctly presented in Table A11.1.56. Similarly, in Table A11.1.57, rows for VPs 7 to 22 should also be ignored, as they are correctly presented in Table A11.1.58. In Table A11.1.59, rows relating to VPs 11, 13, 14 and 22 to 26 should be ignored, as they are correctly presented in Table A11.1.60. The remaining differences between the standard vantage point tables and Table A11.1.63 are due to apportioning of hours (figures for the whole month v's survey hours only up to the 15th September end to the breeding season).

In relation to (iii) highlighted above from SNH's survey guidelines is the recording of 15 in-coming flights, in order to determine the flight patters from off-site foraging, notably at sea. The

number of red-throated diver flights is recorded in Table A11.1.61. In total, 100 flights have been recorded between 2003 and 2012. Combined with the results of the breeding diver surveys over this same period, this is considered wholly sufficient to establish a coherent and sufficiently complete view of diver movements and associated collision risk at Strathy South.

Finally, in relation to (iv) above, dawn and dusk survey coverage (drawn from SNH's guidelines), we have considered this and, in particular, examined the timings of flights from in Appendix 3 of ES Addendum Technical Appendix A11.1. Overall, we conclude that there is a significant proportion of vantage point survey effort carried out at dawn or dusk, and that this is balanced with survey effort at other times of day. We have, for example, reviewed the times of the 2012 flights from Loch ID 64 south, that were recorded from VP 17 and 18. The 12 flights took place between 8th May and 11th July, and are tabulated below (Table 2).

TABLE 2. TIME OF DAY OF SELECTED 2012 DIVER FLIGHTS

Flight ID	VP	Date (2012)	Flight Start Time
226	17	11th June	16:55
227	17	11th June	17:34
128	17	8th May	09:59
130	17	8th May	11:15
124	17	8th May	07:10
133	18	9th May	06:40
135	18	9th May	09:43
354	18	11th July	07:26
234	18	12th June	17:20
357	18	11th July	11:00
355	18	11th July	09:10
355	18	11th July	09:10

The spread of flight times for these north/south flights associated with Loch ID 64 adds credence to the view that such flight patterns are highly unlikely to have gone completely un-recorded even when vantage point watches were not at dawn or dusk. Overall, and in tandem with the findings on the diurnal spread of red-throated diver flights reported in the ES for the Viking Wind Farm (Natural Research Projects Ltd. Viking Bird Report 2009), we are confident that the vantage point surveys at Strathy South provide a sufficient temporal spread of survey coverage to ensure a robust sample of flight activity has been recorded over the 2003 to 2012 period.

Summary in Relation to Red-throated Diver Coverage

We wish to highlight that, related to the distribution of vantage point coverage, and the number and distribution of flights recorded, there is a robust and comprehensive data set to inform the assessment of impacts on red-throated divers. Critically, in combination with this, it is evident that the potential for impacts from collision and displacement have been significantly reduced by the deletion of eight turbines. Combined with the original embedded mitigation in the 2013 Modified Layout (i.e. the turbine-free corridor that was included in its layout design), the following is therefore critical to the final assessment of collision risk from the remaining 39 turbines:

From the north: The compilation of all 2003 – 2012 (Figure A11.1.43) clearly reveals that over this entire period, there is no evidence of a regularly used flight path in or out of Loch 64 or any other lochan. Turbines 69, 72 and 70 therefore present negligible risk of collision for red-throated divers.

From the northeast, east and southeast: The compilation of all 2003 – 2012 (Figure A11.1.43) shows a limited level of flight activity that crosses any 'at risk' area from these directions (as the 2013 Modified layout excluded turbines in this corridor as embedded mitigation, in recognition of the area's combined use by red-throated diver, nesting hen harrier and greenshank).

From the south: Despite the comprehensive VP coverage of the western arm of the wind farm, the only occasion when red-throated diver flights were coming in and out of Loch ID 64 from the south was in 2012. There is no indication of any such occurrence in any other survey year (and hence our categorisation of this pattern of flight activity as 'atypical').
From the southwest: The compilation of all 2003 – 2012 (Figure A11.1.43) shows a degree of flight activity in and out of Loch 64 from this sector, but there is no indication either of a consistent flight route or a significant proportion of flights occurring to or from this direction.

From the west and northwest: The data set covering 2003 – 2012 shows that the area to the west and north west formed a regularly used flight corridor from Loch ID 64. However, the entire arc of airspace from T52 in the south clockwise to T69 in the north is now free of turbines and therefore presents no collision risk to divers flying in or out of Loch ID 64, in these directions.

We trust that the above provides the required clarification and details that enable SNH to review its position on red-throated divers.

We have also recently forwarded additional details on additional off-site diver raft provision, and we trust this is of assistance. If there are any further measures SSER can undertake, we would be willing to consider SNH's recommendations.

2. Greenshank

We note SNH's comments on the revised flight detection analysis and would provide the following comments on this response:

2.1 Distance Detection

Whilst we understand SNH's query regarding lower greenshank flight activity density (FAD) within the 0-250m rather than the 250-500m distance band resulting from observer disturbance, disturbance is clearly only one of several plausible explanations for this effect[2]. As indicated in the RPS note on the revised detectability analysis (Appendix 2 of our 24th December 2013 response), other possible explanations for this effect include the likelihood that VPs are sited in locations that are used less by breeding greenshank and that the area encompassed by the 0-250m distance band is small (so that there is only a low probability of occurrence here). The means of addressing this low FAD in the 0-250m distance band is to exclude this distance band and re-calculate the correction factors without these data. This is exactly what has been done in RPS' 24th December revised analysis.

Having omitted the 0-250m distance band data, the revised analysis re-calculated a correction factor based upon the differences in FAD between the 250-500m band and the two further distance bands. 'What if' scenarios were then applied to generate increasingly precautionary results. To allow for the possibility that FAD was underestimated within the 250-500m distance band, calculations were therefore undertaken to show the effect of doubling the correction factor on the estimated collision risk (equivalent to a 50% underestimation of FAD at 250-500m). Such a precautionary underestimation of FAD within the 250-500m distance band is approximately equivalent to the observed difference in FAD between the 250-500m and 500-1000m distance bands, and would be unlikely. Despite these assumptions, the resulting collision estimate remains relatively low. In fact, taking an even more extreme precautionary approach that assumes only 25% of the actual flight activity within the 250-500m distance band was recorded during surveys (which seems inconceivable given that surveys were undertaken by experienced observers), the corrected collision risk estimates for the revised 39 turbine design increase to just 0.2 - 0.25 birds per annum (equivalent to 1 death every 4 - 5 years). This compares to a considerably lower rate of 0.10 – 0.12 collisions per annum for the 39 turbine

[2] All fieldwork was undertaken by experienced ornithologists, well practiced in minimising disturbance during fieldwork. Regardless of this, however, in general terms if disturbance did occur, then SNH would need to conclude that all VP watches undertaken in any open habitats would cause such disturbance.

layout, based on a 50% underestimation of FAD at 250-500m. Note that the revised layout has already reduced the collision risk from the original 49 turbine layout (based on a FAD of 50% this was estimated at 0.3 collisons per annum). Even at the revised exaggerated level presented here, the theoretical mortality would potentially be offset by increased breeding productivity, brought about by the reduction in predation from foxes, corvids and pine marten that is likely to arise as a result of removal of the Strathy South forest.

SNH also advise that any corrections to the flight detectability analysis should be based upon using published approaches to the problem, notably distance sampling. We note that this advice was not provided in the initial feedback from SNH (20th November 2013) on the flight detection analysis (nor was it requested for Strathy North). We respectfully also suggest that distance sampling is inappropriate for this purpose. The analyses that have been undertaken examine variation in FAD, which is the number of seconds of flight activity within each distance band divided by the area of that band. This is considered to be an appropriate measure to use as the response variable (and as the variable for which a correction factor is calculated) is analogous to the measure of flight activity used to derive the collision risk estimates. However, distance sampling is based upon analysing the occurrence of individuals or groups of the study species and it is unclear how it could be applied to the flight activity measure. Furthermore, the analysis that has been undertaken examines potentially confounding effects on FAD, as well as accounting for the potential lack of independence arising from the fact that VP locations contribute multiple surveys to the analysis. Therefore, the nature of these data are amenable to analysis using a generalised linear mixed modelling (GLMM) framework and it is again unclear to us how a distance sampling approach could readily be adapted to address these aspects of the data and their analysis.

2.2 Territory Analysis

2.2.1 Background

Firstly, SNH requested that all records of greenshank from the 2010 and 2012 breeding wader surveys be presented. Hancock (1997)[3] identified two periods where greenshank would be most conspicuous, before egg laying (10th April – 25th May) and during chick rearing (26th May – 10th July). Therefore, the data is split between that collected during the two Strathy South survey visits that fell within the first period (Figure 1) and that collected during the two Strathy South survey visits within the second period (Figure 2). For 2012, the corresponding data is presented in Figure 5 and 6. Note that any two registrations not thought to be the same bird were treated as separate. Where registrations were thought to be the same bird, this is indicated within Figures 1, 2 5 and 6 by a solid line joining the registrations.

It should be noted that whilst the methods described by Hancock were based on two visits, the breeding wader survey work at Strathy South for 2010 and 2012 was based on four visits. Additionally, Hancock defines 'high detectability periods' within the egg laying and chick rearing periods that were based on typical pre and post incubation periods. These two periods are:

16th – 30th April
1st – 23rd June

Table 3 presents the survey dates at Strathy South for 2010 and 2012. It can be seen that Visit 1 in 2010 and 2012 and Visit 3 in 2012 fell within the first and second high detectability periods, respectively. All three visits were carried out within a short time period and so minimised the risk of double counting birds. Visit 3 in 2010 was somewhat spread across the second high detectability period and extended beyond it (although this affected only one of the seven survey dates for this survey visit).

3 Hancock, M.H., Gibbons, D.W. and Thompson, P.S. 1997. The Status of Breeding Greenshank *Tringa nebularia* in the United Kingdom in 1995. Bird Study 44: 290-302.

TABLE 3. DATES OF BREEDING WADER SURVEYS AT STRATHY SOUTH		
	2010	2012
Visit 1	19th, 21st, 23rd and 26th April	15th – 18th April
Visit 2	6th, 7th, 10th and 24th – 27th May	14th – 17th May
Visit 3	2nd, 9th, 10th, 11th, 17th, 23rd and 30th June	18th -21st June
Visit 4	6th, 9th, 12th and 13th July	15th – 17th and19th July

2.2.2 Results of the Requested Clarification

Secondly, SNH recommend that a more detailed analysis be carried out in order to clarify how territory centres presented in the 2013 Addendum were calculated. The methods used in the original Addendum submission in 2013 identified nesting, feeding or chick rearing territories (or a combination of these), based on behavioural observations and used records from all survey types, not just breeding wader surveys. As is concluded below, this tended to produce a relatively high estimated population, as an precaution when carrying out the impact assessment.
In response to feedback in SNH's 6th February 2014 response, population estimates are presented below from a count of broods and from a count of breeding 'territories', following the methods of Hancock. In order to provide as full analysis as possible, data from all four survey visits were included. This will also tend to increase the likelihood of obtaining a higher (and therefore more precautionary) population estimate.

2.2.3 Population Estimate From Peak Count of Adults

Following the methods of Hancock, the highest count of adults from either the first survey period (Visit 1 or 2) or the second (Visit 3 or 4) was selected and this figure halved to derive a population estimate.

In 2010, the peak count was recorded from Visit 1, 29 registrations (Figure 1). This produces a population estimate of 14-15 pairs.

In 2012, the peak count was recorded during Visit 3, 31 registrations (Figure 6). This produces a population estimate of 15-16 pairs.

2.2.4 Population Estimate From Peak Count of Broods

Following the methods of Hancock, any adults encountered alarm calling (chipping) during the second survey period were assumed to be accompanying broods. It was assumed that each registration represented a single brood. However, there were four instances where several registrations were in close proximity (within 200m) or within a discrete area (bog pool system within Yellow Bog) that were considered to be records of a single brood.

In 2010, the population estimate based on the number of broods was 2 pairs from Visit 3 and 12 pairs from Visit 4 (Figure 3). Note that where registrations from Visit 3 and 4 were very close, in NC 5476 it was assumed they represented the same pair. Therefore the total is 13 pairs.

In 2012, the population estimate based on the number of broods was estimated at 6 pairs from Visit 3 and 15 pairs from Visit 4 (Figure 7). Note that the registrations from within Yellow Bog were assumed to be from the same pair within each visit and also across both visits, as were those within Strathy South Forest near Loch 64 at NC 78 52. Finally the registrations to the south at NC 80 49 were also considered to be from the same pair. Therefore in total, there were an estimated 19 pairs in 2012.

Results are summarised in Table 4.

TABLE 4. NUMBER OF PAIRS BASED ON BROOD COUNT			
	VISIT 3	VISIT 4	COMBINED
2010	2	12	13
2012	6	15	19

2.2.5 Population Estimate From Count of Breeding Territories

As above this followed the methods of Hancock. In Step 1, an 800m buffer was applied to each of the brood count registrations from the second survey period to provide an initial indication of territories. The methods described by Hancock do not state explicitly if territories derived from Step 1 with overlapping buffers should be treated as the same or separate territories. Thereore, counts of breeding territories present both scenarios (Table 5and 6)

Figure 4a and 8a present this data for 2010 and 2012 respectively. In 2010, there were an estimated 14 territories, although if the assumption described above is accepted this becomes 6 territories. In 2012, there were an estimated 19 territories (based on the assumptions presented within the population estimate from brood counts regarding registrations very close together). Based on the assumption that overlapping buffers belong to the same territory, the estimated number of territories in 2012 drops to seven.
In Step 2, additional records of alarm calling and birds in song from the first survey period, plus records of birds in song from the second survey period are added to the mapping. Again, an 800m buffer is applied to all of these additional registrations. Where any of these additional registrations fall outside of an existing 800m buffer from Step 1, they are considered to be an additional territory. If buffers between additional records in Step 2 overlap, they are considered to be the same territory.

Figures 4b and 8b present the data for 2010 and 2012. In 2010, there were an additional four territories. In 2012, there were an additional three territories.

The total number of breeding territories is summarised in Table 5and 6. Table 5 resents the results based on the assumption that overlapping territories from Stage 1 are treated as individual territories, whereas Table 6 presents the results based on the assumption that these overlapping territories are part of the same territory.

TABLE 5 NUMBER OF BREEDING TERRITORIES (INDIVIDUAL TERRITORIES)			
	STEP 1	STEP 2	OVERALL
2010	14	4	18
2012	19	3	22

TABLE 6 BREEDING TERRITORIES (OVERLAPPING TERRITORIES)			
	STEP 1	STEP 2	OVERALL
2010	6	4	10
2012	7	3	10

2.2.6 Summary

Table 7 summarises the population estimates from the three different methods of Hancock in relation to the estimates provided in the 2013 Addendum.

In 2010, the lowest estimate was produced from Hancock's count of broods, whilst the highest estimate was derived from the RPS 2013 Addendum.

In 2012, the lowest estimate was produced from Hancock's peak count, whilst the highest population estimate was derived from the RPS 2013 Addendum.

TABLE 7. POPULATION ESTIMATES				
	Peak Count	**Count of broods**	**Count of breeding territories**	**RPS 2013**
2010	14 – 15	13	18 (10)	26
2012	15 - 16	19	22 (10)	27

Note:
* Figures in parenthesis represent the estimated breeding territories where registrations with overlapping buffers represent a single territory.

In order to examine any variability between the territory centres presented in the 2013 Addendum , the minimum, maximum and mean distances to turbine bases of population estimates based on Hancock were compared to the 'assumed' territory centres presented in the 2013 Addendum (Table 8 and 9).

In 2010, the mean distance of territory centres to turbine bases calculated from the data presented in the 2013 Addendum was 723m compared to a range of 1012m – 1194m for the population estimates based on Hancock. The original registrations had a mean distance of 1041m. The closest territory centre from the 2013 Addendum was calculated to be 283m from the nearest turbine, whereas the figure from the Hancock analyses provided a range of between 177m – 312m The number of territory centres within 500m of a turbine base in the 2013 Addendum was eight, whereas the methods of Hancock provide a range of three to nine.

TABLE 8. 2010 SUMMARY DISTANCES TO NEAREST TURBINE					
	All Registrations	**Peak Count**	**Brood Count**	**Breeding Territory**	**RPS 2013 Territory Centres**
Minimum distance	177m (T2)	243m (T52)	312m (T24)	177m (T2)	283m (T52)
Maximum distance	2774m (T69)	2774m (T69)	2518m (T69)	2518m (T69)	1438m
Mean	1041m	1031m	1194m	1012m	723m
Total number within 500m	17	5	3	9*	8
Total number within 800m	36	15	5	18*	16

Note:
* Figures for Breeding territory relates to registration locations within territories rather than an assumed territory centre.

In 2012, the mean distance of territory centres to turbine bases calculated from the data presented in the 2013 Addendum was 856m compared to a range of 783m – 921m for the population estimates based on Hancock. The original registrations had a mean distance of 875m. The closest territory centre from the 2013 Addendum was calculated to be 244m from the nearest turbine, whereas the figure from the Hancock analyses provided a range of between 255m – 256m, although the nearest registration was recorded 221m from the nearest turbine base. The number of territory centres within 500m of a turbine base in the 2013 Addendum was seven, whereas the methods of Hancock provide a range of six to twelve.

TABLE 9. 2012 SUMMARY DISTANCES TO NEAREST TURBINE					
	All registrations	**Peak Count**	**Brood count**	**Breeding territory ***	**RPS 2013 territory centres**
Minimum distance	221m (T26)	255m (T47)	256m (T13)	256m (T13)	244m
Maximum distance	2738m (T69)	2567m (T69)	2636m (T69)	2636m (T69)	2008m
Mean	875m	783m	921m	910m	856m
Total number within 500m	26	12	6	10*	7
Total number within 800m	55	24	18	28*	15

Note:
* Figures for Breeding territory relates to registration locations within territories rather than an assumed territory centre.

Alec McDonald
17 February 2014

We trust the above provides the clarification sought by SNH in relation to this species.

3. Golden eagle

SSER understand the precautionary approach taken by SNH and would propose to undertake the following works as a pre-commencement planning condition to enable SNH to advise of the need for the forestry and construction timing restrictions. The proposed draft condition could be worded as follows:-

Prior to commencement of forestry or wind farm construction works, SSER will appoint suitably qualified and licensed ornithological specialists to:-

- carry out fieldwork to assess line of sight from the Loch Strathy golden eagle nesting locations. The method proposed is to visit the nest/s, obtain 10 figure grid references, and identify the extent of the southern boundary of Strathy Forest that is visible from the nest/s; and

- provide photographs of the nest location and accompanying map of the 'visible extent of forest edge, within 3.5km of the nest'.

Based on the outcome of this survey work, the results of which would be provided to The Highland Council, SNH and RSPB, SNH would advise if there are any restrictions on the timing of works and specify these distances in line with identified safe working distances from the nest, where there was a line of sight.

Reason: To protect breeding golden eagles from the risk of disturbance.

We also wish to bring to your attention the fact that SSER would be willing to cover the cost of installing a nest camera at the Loch Strathy nest/s, subject to RSPB's approval (as they are land owners). The use of nest cameras is becoming more widespread, and can, as you will be aware, be a valuable tool in assessing nesting behaviour, breeding success, and food provisioning in particular. We would anticipate that this could be included as part of the Breeding Bird Monitoring and Protection Plan that would be a condition of any consent, if Strathy South is approved (and if RSPB are amenable). We would welcome SNH's view on this option.

We very much appreciate the time and assistance of SNH staff in reviewing the clarifications above. We hope we have provided all the information requested, but please do not hesitate at all to contact us if there are any further details we can provide. We look forward to hearing from you at your earliest possible convenience in this regard, and to meeting should there be any further issues to resolve. Thank you once again for your time and consideration.

Yours sincerely
for RPS

Dr. Simon Zisman
Operational Director

CC Ken McCorquodale, The Highland Council
CC Energy Consents Unit

Catherine MacKenzie

From: Kate Lyon
Sent: 10 July 2014 12:24
To: Catherine MacKenzie
Subject: FW: Strathy South wind farm - response to RPS from SNH
Attachments: 140321 - Strathy South - response to RPS - 21 March 2014.pdf

ENVIRON

Kate Lyon, BSc, MSc, AIEEM, AIEMA | Senior Consultant

DD: +44 1392 440 611
T: +44 1392 440 600

From: Nicki Small [mailto:nicki.small@sserenewables.com]
Sent: 01 April 2014 11:19
To: Nathan Swankie; Kate Lyon
Subject: FW: Strathy South wind farm - response to RPS

FYI

From: Alexander Macdonald [mailto:Alexander.Macdonald@snh.gov.uk]
Sent: 21 March 2014 14:18
To: 'zismans@rpsgroup.com (zismans@rpsgroup.com)'
Cc: Nicki Small; 'EconsentsAdmin@scotland.gsi.gov.uk (EconsentsAdmin@scotland.gsi.gov.uk)'; 'ken.mccorquodale@highland.gov.uk (ken.mccorquodale@highland.gov.uk)'; 'paul.mcgillivray@scotland.gsi.gov.uk'
Subject: Strathy South wind farm - response to RPS

Dear Simon

Please find attached our response to your letter dated 17 February 2014 for Strathy South wind farm.

Regards
Alec

Alexander Macdonald
Operations Officer
Scottish Natural Heritage
The Links
Golspie Business Park
Golspie
KW10 6UB

Alexander.Macdonald@snh.gov.uk
Tel: 01408 634063

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Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

Simon Zisman
RPS Planning & Development
Ocean Point One
4th Floor
94 Ocean Drive
Edinburgh
EH6 6JH

21 March 2014

Dear Simon,

Strathy South wind farm addendum – SSER clarifications and further response

Thank you for your letter of 17 February for the proposed Strathy South wind farm.

We have reviewed the clarifications and further response to the outstanding ornithological matters and offer advice. We also confirm our position with respect to the Caithness and Sutherland Peatlands SAC.

Caithness and Sutherland Peatlands SPA

a. Red-throated diver

We consider that there has not been enough dawn and dusk watches covering Loch 64 and there is too much reliance on the generic vantage point watches. Our advice is that additional vantage point work to inform a robust assessment of flight activity rates and flight directions for Loch 64 should be carried out. We would be happy to provide advice on the level of additional survey work required. We therefore maintain our objection.

b. Greenshank

We welcome the reanalysis of greenshank registrations. The number of territory centres within 800m of a turbine now appears to be greater than in previous analyses. Because of the novel nature of assessment we intend to consider the submitted information further using additional input from our ornithological team. We acknowledge the offer from SSER and RPS to meet should there be further issues to resolve.

We will get in contact next week to let you know when we can provide updated advice.

Our position with respect to greenshank is maintained i.e. objection.

c. Golden eagle

We note the proposed pre-commencement planning condition to undertake fieldwork to assess line of sight from Loch Strathy golden eagle nesting locations. We welcome the suggested appointment of a suitably qualified and licensed ornithological specialist to carry out fieldwork. However, as this work has not yet been carried out, our position with respect to golden eagle is maintained (i.e. objection) until we receive suitable supporting evidence to amend our advice.

The Links, Golspie Business Park, Golspie, Sutherland KW10 6UB
Tel 01408 634063 Fax 01408 634222 www.snh.org.uk
An Ceangal, Roan Gnìomhachais Ghoillspidh, Goillspidh, Cataibh, KW10 6UB
Fòn 01408 634063 Fax 01408 634222 www.snh.org.uk

Caithness and Sutherland Peatlands SAC
a. Blanket bog and wet heath habitats

i) Peat Landslide and Hazard Risk Assessment
I can confirm that we have received the letter from SLR Consulting confirming that the SAC is not at significant risk from the impacts of a peat slide resulting from the construction and operation of the proposed wind farm. We therefore withdraw our objection.

b. Otter
As it has been confirmed that the SAC is not at significant risk from the impacts of a peat slide we also withdraw our objection with respect to otter.

Please let Alexander Macdonald (Alexander.Macdonald@snh.gov.uk) know if you need further information or advice from us in relation to this proposal.

Yours sincerely,

David Mackay
Operations Manager
Northern Isles and North Highland

c.c. Nicki Small, SSE
Gordon Brown, ECDU
Ken McCorquodale, Highland Council

RPS

Our Ref: SEC7232/SZ

E-mail: **zismans@rpsgroup.com**
Tel No: **0131 555 5011**
Date: **03 April 2014**

David Mackay
Scottish Natural Heritage
The Links, Golspie Business Park
Golspie, Sutherland
KW10 6UB

Dear David,

RE: SCOTTISH NATURAL HERITAGE'S 21ST MARCH 2014 RESPONSE TO STRATHY SOUTH WIND FARM ADDENDUM

Thank you for recently providing SNH's latest letter on the Strathy South Wind Farm application (dated 21/03/20).

SSER notes the closure of all protected species and habitat issues and welcomes SNH's withdrawal of its remaining residual objections on peat slide risk assessment and otters. There are therefore no outstanding natural heritage or Natura 2000/Habitat Regulations matters that may inform a planning decision or public inquiry other than the three remaining bird species highlighted in recent correspondence, namely golden eagle, red-throated diver and greenshank. This represents considerable progress and the culmination of the many years of careful design evolution with the project, including mitigation and environmental enhancement.

Furthermore, with respect to the three remaining bird species, we believe that given further consideration, and taking account of Habitat Regulations requirements, these matters can be successfully resolved.

Golden Eagle

With regard golden eagles, to avoid any perceived confusion here, SNH refer to fieldwork being required, yet what is under discussion is fieldwork in relation to pre-commencement survey work to ensure construction activities do not impact on any eagle nests during the nesting season. All fieldwork and data required for the Environmental Impact Assessment associated with the development has been carried out according to SNH guidance, is fully compliant and indicates no impact on this species.

There is however, a very specific question which you have not addressed in your letter which we repeat here:

Why is SNH seeking to apply a 3.5km buffer between Strathy South and the nest location? Firstly, SNH is not requesting such a buffer elsewhere, either at other windfarm developments or other forms of development activity, including forestry. SNH has therefore allowed numerous developments to be consented within closer range of nesting eagles than 3.5km, with no such restrictions. Secondly, and in tandem with this point above, no such buffer was sought for Strathy North, despite a second territory falling within this distance. Thirdly, SNH's own commissioned research into disturbance distances (Ruddock and Whitfield 2007), and the references contained therein, give 2.5km as the largest buffer referred to in their comprehensive review of the literature (for ground based disturbance), with all others distances below this and generally within the 800m to 1.5km range. The expert opinion survey undertaken as part of this research also considered maximum disturbance ranges to be up to 2km. As SNH has noted already, the closest Strathy South golden eagle nest is 2.5km from the site boundary and forest edge. The closest turbine to the Strathy South eagle nest is approximately 2.8km away.

.

Notwithstanding the above question over the buffer size, SSER has proposed a clearly workable and standard way forward similar to other wind farm developments, that enables the requested survey to be carried out at the appropriate time (especially since it means the line of sight will be assessed from the particular breeding location being used ahead of the construction year and so the relevant breeding season, rather than doing the fieldwork now). SNH also omitted to respond to SSER's offer of funding nest cameras, which again could be put in place as part of the conditioned monitoring, to yield data on provisioning rates, prey and breeding success.

In light of the above, we therefore respectfully request SNH reconsiders this issue and either accepts the proposed condition or provides suggested modifications to it that would enable this issue to be resolved, enabling confirmation of no contribution to an adverse impact on integrity of the Caithness and Sutherland SPA, arising from this species.

Red-throated Diver

Your correspondence highlights Loch ID 64 as being the only location where SNH has a remaining concern about possible impacts on this species, and we welcome this. Following our earlier requests, we note your recent offer "to provide advice on the level of additional survey work required" and request that this advice be made available (by no later than 10th April), in order that it can be considered by SSER.

We cannot, however, agree that there has been insufficient dawn or dusk coverage to determine flight patterns to and from this lochan, and furthermore we do not accept there has been an over-reliance on generic vantage points, as the data collected are equally applicable.

Our previous letter dated 24/12/13 highlighted points from the Addendum to clearly demonstrate the spread of flight activity over relevant areas derived from several years of extensive data. Our further response to you, dated 17/02/14 provided the clarifications requested by SNH. We see no response to these clarifications as sought. We respectfully request that SNH specify more precisely what their residual concern actually is, based on the existing information and clarifications we have provided. To state that additional dawn and dusk surveys are required is not sufficiently precise, and SNH have made no attempt, despite our requests, to suggest why flight activity could potentially vary from that which has already been recorded.

As per my email dated 27/03/14, in order for any remaining issues on this species to be addressed, we suggested as a precautionary approach that SNH provides, based on the information available to date, the turbine (or turbines) that are still considered problematic in relation to either displacement or collision risk.

We do note, from your email dated 01/04/14 in reply that SNH considers itself "*unable to identify specific turbines which are likely to cause potential collision risk or displacement for red-throated divers*". Given the volume of information available, collected over a 10 year period, and SNH's ability to provide casework responses on other sites where divers are present (with far less data), we question why SNH feel in this case they are incapable of providing any advice at all on Strathy South. In combination, the extent, duration, coverage and volume of flight activity data far exceeds the level required by SNH guidance, given the overall purpose of diver flight activity surveys, and taking account of the distribution of nesting lochans.

Given SNH's previous request for turbine removal (for black-throated diver and wood sandpiper), and SSE's initial acceptance of this pending resolution of all other concerns, you are aware, there are no turbines in any of the known flight paths from the lochan to the north, west, east or south west. Therefore, in the absence of any feedback from SNH, we assume that turbine T56 (approximately 563m to the nearest edge of Loch 64) to the south may be the one that you consider of remaining concern? We would be grateful for confirmation in this respect, and the additional feedback requested previously.

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Greenshank

We appreciate the time being afforded to consider the interpretation of greenshank data. We do, however, wish to highlight that firstly we do not accept the use of 800m buffer as a suitable buffer distance from nesting territories. Evidence of observed wader breeding displacement is variable, but shows in the majority of cases it is below 300m, if indeed, displacement is detected at all, This evidence is already presented in the Addendum.

Furthermore, we do not concur that the number of actual territories has increased. In combination, given the typical distances to turbines, displacement is not judged to be a significant risk in terms of the Habitat Regulations. I must also take issue with the use of the term 'novel' in respect of RPS approach here. We strongly disagree with this term as it indicates an approach outside that set out by SNH's formal guidelines. In fact interpretation has gone beyond the guidance owing to amount of data we have available. Our approach is even more precautionary than that set out by SNH in its formal guidelines. Therefore I would appreciate if you would acknowledge this, as the current phraseology implies a lack of appropriate consideration of this issue by RPS.

You will be aware that from SNH's initial deadline for response of September 2013 and the additional months we have allowed SNH to consider our position, that we are hugely time constrained in terms of meeting deadlines set for us by Highland Council, and also to fully inform any pre-commencement condition survey work, which we hope to begin with some urgency. Given that we have been seeking a meeting between our respective ornithological experts for such a considerable time now, and given that we have extended the deadline for concluding responses with SNH on this project by over six months, we feel it is wholly reasonable to again request a meeting at your earliest opportunity. As we have indicated previously, given that your ornithology experts are based in Shetland and Inverness, we can be at either location at short notice at a time convenient to SNH.

Thank you once again for your time and consideration.

Yours sincerely
for RPS

Dr. Simon Zisman
Operational Director

CC: Paul McGillivray, Scottish Government, ECDU
CC: Ken McCorquodale, Highland Council, Planning

Nicki Small

From: Neil Lannen
Sent: 04 April 2014 21:22
To: Jon Soal; Nicki Small
Subject: Fw: Strathy South Windfarm

For info

N

From: Andrew Bachell [mailto:Andrew.Bachell@snh.gov.uk]
Sent: Friday, April 04, 2014 04:56 PM
To: Neil Lannen; Brendan Turvey <Brendan.Turvey@snh.gov.uk>
Cc: Dave Mackay <Dave.Mackay@snh.gov.uk>; Nick Halfhide <Nick.Halfhide@snh.gov.uk>
Subject: RE: Strathy South Windfarm

Neil

Thanks for the email. I will be dealing with this, it's not really one for Brendan. However, I am copying in Nick Halfhide, Head of Operations, who may well need to make time to assist with this case.

In the light of the issues you have raised I have set up an internal meeting for Monday so that I can be fully briefed. By that meeting I am hoping to have some feedback on the ornithological advice, which is now being reviewed, and a clear answer as to when we can meet with your ornithologists. I agree that face to face contact is needed and we should make contact early in the week to arrange. I will do my best to ensure that your deadlines can be met.

Thanks you again for raising these matters with me direct.

Regards

Andrew

Contact 07786701408

From: Neil Lannen [mailto:neil.lannen@sserenewables.com]
Sent: 04 April 2014 13:04
To: Andrew Bachell; Brendan Turvey
Subject: Strathy South Windfarm

Dear Brendan and Andrew

I am writing to seek an urgent meeting with you - either in person or via conference call regarding SSE Renewables' proposed Strathy South wind farm project in Sutherland. Whilst good progress has been made in addressing the majority of SNH's concerns on which initial objections were raised, the process of concluding the few remaining matters (which we are still working towards to reach agreement with you) is becoming increasingly prolonged and somewhat exasperating.

Our letter dated 17/02/14 (which I attach for your information) has not, in our view, been taken as seriously as we might expect at this late stage. Indeed, we are so frustrated that we sense that it is almost as if the SNH Golspie office is seeking ways to delay if not object rather than pragmatically deal with the clarifications our environmental experts have provided.
We assert, and this is supported by our independent adviser, that outstanding concerns being raised can be readily overcome either through mutual agreement or through planning condition, yet our proposals for this way forward appear not to have been considered or responded to (I include our Email and SNH's response dated 01/04/14).

I enclose a letter which we have sent today to David Mackay in which we are restating our current position and proposal for progressing matters. In summary, I outline the three remaining issues.

Golden Eagle
- We are being asked to carry out fieldwork now to confirm the requirement for a restriction on forestry clearance activities along with construction to a buffer of 3.5km from a nest which is located 2.5km from the forest edge, to assess if there is a line of sight during the breeding season. This however is being presented as an objection until the field work is completed instead of being treated as a planning condition. Furthermore this is contrary to advice provided for other consented wind farms and we have provided evidence to support this.

Greenshank
- The 800m 'buffer' being requested is extreme, and contrary to advice provided on the Strathy North windfarm. Indeed, evidence demonstrates that there is little or no disturbance to this species within this precautionary distance being stated. SNH appears to be applying an inappropriate figure here which is perplexing, even taking into account any requirement to be precautionary. Having responded to the clarifications sought by SNH in your response 06/02/14, in detail in our letter dated 17/02/14, we still await SNH's position on this matter.

Red-throated diver
- We are being asked to provide more survey work at dawn and dusk for one loch. We are concerned that SNH has failed to objectively consider how, after collating data across a 10 year period, we have established an overall detailed view of what is occurring on this site, which is far over and above the usual two years of surveys which would be required by SNH. From this extensive data set a large number of surveys (considerably more than the number required) have covered the area where flights from this loch would be detected. We have already agreed to remove a large number of turbines to address concerns over the wider ornithological matters including RTD, taking account of the more characteristic east and west flight activity, and there are now no turbines in any flight direction used to any degree by this species apart from to the south from this loch location. Over the ten year period we have studied this site, there has been one breeding nest confirmed in 2012 and from that occasion flight lines were observed away from the usual east/west passage. Our proposed means of dealing with this result has been to suggest removal of further turbines, on an ultra pre-cautionary basis (despite our disagreement with the basis of the concern). The other option, given the very weak nature of the concern from the extent of knowledge and information about the site and RTDs, is to impose a condition subject to pre-construction surveys confirming whether RTD activity has actually changed.

However further dialogue on turbine removal now seems to be closed by your staff which we consider to be obstructive given that we have removed 38 turbines from the site already due to other concerns previously intimated since this project was first under application.

We have fully complied with all SNH methodologies and guidance. Yet our consultants work on Greenshank was described as 'novel' and we strongly disagree with this term as it indicates an approach outside that set out by SNH's formal guidelines. In fact interpretation has gone beyond the guidance owing to the amount of data we have available on the site and the precautionary approach SNH has advised.

We are concerned any requests for our independent expert bird consultant to meet or even speak to your ornithological specialist in Shetland, continue to be closed. As you know we have extended deadlines for 6 months now and repeatedly sought this meeting, whilst being mindful not to tie up your resource. Whilst we have been very amenable to offer extensions to SNH in the interests of overcoming concerns, the delays have meant we have consistently missed Highland Council's planning committee's from November 2013 up to the last programmed for April, with further delays implied by the recent feedback to do some more monitoring on red throated divers (which we consider unjustified at this stage, given that we have followed SNH guidance and have assembled a particularly comprehensive data set for this site).

We have provided SNH with a number of extended deadlines from the original September 2013 response date, see the table below. Within this time we have been offered one meeting during November 2013 with the Golspie office staff in Inverness with your ornithologist David Wood dialling in to this for a strict 45 minutes, due to other apparent commitments, despite the many offers to arrange at a time of convenience over a period of many months. We appreciate that SNH have had resource issues, and we have been very mindful and respectful of this, however we think given the technical nature of the above issues, a meeting is a very reasonable request. We understand the ornithologist is Shetland based. As previously and repeatedly offered, we can go there at short notice and would ask that you help facilitate this? At the very least we urge that a telephone conference be permitted between our ornithological experts.

We would respectfully ask that these matters be considered at senior level - and that a spirit of pragmatism and practical dialogue which seeks positive ways forward be fostered at this very late stage in proceedings so that we can at the very least meet our Highland Council deadline for a June planning committee. Your assistance in this matter would be much appreciated. If an appropriate and robust resolution can be found to these three remaining issues (and we believe this is the case), there remains considerable environmental benefit to be derived from this wind farm, as we have previously stated, through forest removal, accompanied by long-term habitat and peatland restoration on

and off-site. Perhaps an open dialogue session with yourselves and our senior management might be in order to find an acceptable resolution to these last few hurdles?

Best regards

Neil Lannen

Thoiribh an aire airson adhbharan gnothaich, ‘s dòcha gun tèid sùil a chumail air puist-dealain a’ tighinn a-steach agus a’ dol a-mach bho SNH.

Catherine MacKenzie

From: Kate Lyon
Sent: 10 July 2014 11:50
To: Catherine MacKenzie
Subject: FW: Strathy South wind farm - SNH

ENVIRON

Kate Lyon, BSc, MSc, AIEEM, AIEMA | Senior Consultant

DD: +44 1392 440 611
T: +44 1392 440 600

From: Dave Mackay [mailto:Dave.Mackay@snh.gov.uk]
Sent: 10 April 2014 09:51
To: 'zismans@rpsgroup.com'
Cc: Neil Lannen; Alexander Macdonald
Subject: Strathy South wind farm

Dear Simon, cc. Alec and Neil

Thank you for writing to me last week. Your letter highlights a number of concerns regarding the Strathy South wind farm which Neil Lannen of SSE also highlighted in an email to Andrew Bachell (Director of Operations) on 4 April. Given the issues being raised are the same I propose that we treat both pieces of correspondence together and respond to you both at the same time. I trust you would find this acceptable?

To keep you informed of actions to date, key SNH staff met on Monday to discuss both pieces of correspondence. From that meeting Andrew Bachell has asked for a review of the bird advice we have provided in relation to red-throated diver, golden eagle and greenshank to be undertaken urgently. That review will require discussion with David Wood who, unfortunately, is on leave until 14 April. However, we aim to have completed that review to be able to set up a meeting between the relevant ornithologists sometime during the w/c 21 April.

I note your concerns over timescales, so will try and progress things as quickly as possible.

Regards,

David Mackay
Operations Manager
Northern Isles and North Highland

Scottish Natural Heritage
The Links
Golspie Business Park
Golspie
KW10 6UB

Tel: 01738 771 100
Fax: 01408 634 014
dave.mackay@snh.gov.uk

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Nàdar air fad airson Alba air fad

Mr Neil Lannen
SSE
Inveralmond House
200 Dunkeld Road
Perth
PH1 3AQ

30 April 2014

By email to: neil.lannen@sserenewables.com

Dear Mr Lannen,

Strathy South wind farm addendum – updated advice on greenshank, red-throated diver and golden eagle

Thank you for your email of 4 April 2014 to Andrew Bachell, which Andrew has asked me to respond to. Following your correspondence with Andrew we met with Nicki Small and Jon Soal from SSER and Simon Zisman and Colin Ormston from RPS at our Inverness office on Friday 25 April to discuss your concerns about the remaining ornithological issues and the advice we had provided for Strathy South.

Following this meeting and the internal review of our advice, we agreed to provide you with our up-dated position on greenshank, red-throated diver and eagle in relation to the Strathy South wind farm proposal. The key points from that meeting and the review of our advice is detailed below.

Caithness and Sutherland Peatlands SPA

a. Greenshank

We acknowledge that RPS has gone to great length to analyse the greenshank data and have shown considerable acumen in its approach to this difficult issue. The evidence needed to demonstrate no adverse effect on site integrity needs to be beyond reasonable doubt, and we consider that this is not fully met.

The blanket bog habitat around the proposed Strathy South wind farm site is particularly suitable for greenshank and supports high densities. RPS data suggest that this is of the order of 20 breeding pairs. High densities of golden plover and dunlin confirm the high quality of this particular part of the Caithness and Sutherland Peatlands SPA.

RPS has used an approach to calculating collision risk that rests on correcting form detectability of greenshank from vantage points. The Generalized Linear Mixed Model (GLMM) has been used to show that detectability declines with distance from any vantage point, but also that detectability nearest any particular vantage point is lower than might be expected. The reasons for this are unclear though it is possible (indeed likely) that birds are reacting to the presence of the observer. RPS has used a method to correct for this, but the method is subject to assumptions about how detectability declines with distance from the observer. It is this detectability function that is open to doubt, and if as seems possible, the

detection function used still underestimates flight activity, then the collision risk will be similarly underestimated.

The approach taken in our original response was to define a buffer distance (800m) around putative territory centres which would, in our estimation, reduce the potential for interaction with the turbines and therefore collision risk, to a level that would be acceptable. This would involve removal or moving turbines. We are mindful of the fact that greenshank have complex territory holding requirements and tend to use space quite differently to other breeding waders. In particular they may hold temporary display territories away from nesting territories, and birds may move hatched young some distance from nesting territories to feeding areas (often located near sources of standing or running freshwater). The impact such behaviour is likely to have on potential interaction with the proposed turbines is not at all clear.

Using RPS data, it is calculated that in 2010 16 territories lie within 800m of the nearest turbine (any one territory centres may be within 800m of more than one turbine). In 2012 the comparable figure is 15 territories.

Why have we used a figure of 800m?

There are two reasons for this: firstly the figure of 800m is used by Hancock (1997) as a minimum separation distance between greenshank pairs, and looking at the greenshank territory registrations, mean separation distances appear to fall within this distance band. Secondly, and perhaps more importantly, flight activity is marked (even accounting for distance detection) out to about 1,000m. We see no reason why, given the absence of constraints by neighbours, greenshank would not fly out to this distance in the vicinity of constructed turbines (unless of course they showed marked behavioural displacement) which is not obvious from other evidence provided by RPS from other sites where there is some flight data from greenshank, in the vicinity of turbines.

Following our meeting we agreed to look at any further evidence RPS may be able to provide in relation to greenshank activity in the vicinity of operational wind farms. Such evidence would need to be applicable to the Strathy South site and provide strong evidence for us to alter our current advice. You may wish to contact the Scottish Windfarm Bird Steering Group (www.swbsg.org/) as they may hold relevant information.

Following our review and discussion at the meeting our position with respect to greenshank is maintained i.e. objection.

b. Red-throated diver
There are three aspects which have led to our objection with respect to red-throated divers:

i) Survey Effort: The amount of effort centred on one of the breeding lochs (Loch 64) does not meet survey guidelines for the number of hours of dedicated watches. The two survey years for which the best data exist are 2010 and 2012. In 2010, vantage point (VP) 11 spans part of the season and amounts to 12 hours in June and 20 hours in July. In 2012 at VP 11, there were 9 hours in June and 3 hours in July. We consider that there are insufficient hours to establish an accurate level of flight activity and the directions in which birds flew, to and from feeding locations. Checking the other VPs used to establish flight directions and movements suggests that these VPs would be likely to miss a significant proportion of diver flights into and out of the loch. It is accepted that this loch is not used in every year, and this may account in part for the lack of flights, though the reason for this is not clear. Red-throated divers are sensitive to disturbance and it is possible that disturbance at a critical time may have influenced loch occupation. The dedicated survey work that does exist for this location suggests that flights (at collision risk height) lie predominantly in a southerly direction (through the wind farm area), rather than to the north or north-west (i.e. in the direction of the coast where most divers would be expected to feed). It is therefore not clear whether the observed

flight pattern reflects the preferred flight direction or is a result of the limited survey work that can be relied upon to detect red-throated diver flights.

ii) Collision Risk: The potential collision risk alone and *in combination* with other wind farms which affect the Caithness and Sutherland Peatlands SPA may be underestimated, because:
a. We do not have a complete picture of flight activity; and
b. The low level of flight activity that does exist will underestimate potential collision risk with turbines (i.e. it may be much greater than stated in the environmental statement).

iii) Disturbance: In addition to collision risk, we must consider construction disturbance at loch 64 (an SPA pair) which is likely to be temporary and may be permanent. The location of loch 64 suggests that disturbance during construction and subsequent operation may lead to the loss of this pair. We regard this eventuality as being very likely. While evidence for displacement of red-throated divers resulting from wind farm construction is limited, it should be noted that numbers of red-throated divers at Burgar Hill in Orkney, did originally decline from five to two breeding from the breeding lochan after wind turbine construction. At the larger Smøla wind farm, red-throated divers no longer nest within 2km of the wind farm; moreover divers were not seen to fly through the wind farm subsequent to its construction. While the presence of divers at Burgar Hill is often cited as demonstrating tolerance of wind farms, the size and scale of Burgar Hill compared to Smøla suggests that it provides a poor model for what might happen at Strathy South.

The loss of the pair of divers at loch 64 (and possible collision risk impacts on other breeding pairs) means that we cannot conclude that the integrity of the Caithness and Sutherland Peatlands SPA will be maintained.

We advise that additional vantage point work to inform a robust assessment of flight activity rates and flight directions for loch 64 should be carried out. We acknowledge that loch 64 is not used in every year by breeding red-throated divers, so further survey work may not be of help unless the divers are present.

Following our review and discussion at the meeting our position with respect to red-throated diver is maintained i.e. objection.

c. Golden eagle
We have previously advised that the eagle nest site located to the south of the wind farm site boundary was vulnerable to disturbance. We advised that no forest removal or wind farm construction operations within 3.5km should be undertaken during the period February to August inclusive to mitigate for breeding golden eagle. Following an internal review of our advice we have concluded that disturbance distances are considerably less than 3.5km. Given that little flight activity was recorded over the proposed wind farm area or adjacent land, displacement impacts are also likely to be negligible.

As a result of our review we withdraw our objection with respect to golden eagle.

I apologise for any inconvenience our earlier advice may have caused.

Should the wind farm proposal gain consent we recommend that the known nest be monitored throughout construction and perhaps operation, to establish whether *any* response to possible disturbance from construction can be detected. The methods for doing this can be subject to further discussion, though the use of nest cameras is considered to be unnecessary and potentially disturbing in its own right.

Please let me know if you need further information or advice from us in relation to this proposal.

Yours sincerely,

David Mackay
Operations Manager
Northern Isles and North Highland

c.c. Simon Zisman, RPS
Paul McGillivray, Scottish Government, ECDU
Ken McCorquodale, Highland Council, Planning

David Mackay
Operations Manager
Northern Isles and North Highland
Scottish Natural Heritage
The Links, Golspie Business Park
Golspie, Sutherland
KW10 6UB

SSE Renewables Developments (UK) Limited
Inveralmond House
200 Dunkeld Road
PERTH
PH1 3AQ

Telephone: 01738 456724/456000
E-mail: George.baxter@sserenewables.com

Date 15 May 2014

Dear David,

SSER response to Scottish Natural Heritage's 30th April 2014 response to Strathy South wind farm Addendum.

Thank you for SNH's latest letter on the Strathy South Wind Farm application dated 30th April 2014. As Neil Lannen is currently on holiday I am picking up the correspondence.

Following our useful meeting with Andrew Bachell on Friday 2nd May, we are aiming to hold a follow up meeting this coming Friday 16th May to hopefully conclude our discussions.

We are delighted that SNH has now withdrawn 15 of 17 concerns about the wind farm, and we are equally pleased that the remaining issues appear to be manageable in that they can either be overcome by planning condition, or by further dialogue regarding the interpretation of data, or an appropriate level of precaution applied where justified and reasonable. We believe the level of information, interpretation and available solutions is more than sufficient for the decision maker to make a judgement in due course. So as to provide a reasoned response to your remaining concerns I go into these issues in some detail in this letter, but hopefully we can engage constructively on these matters when we meet later this week.

Golden eagle

I am pleased that SNH has confirmed no concern remains on the basis of golden eagle and we thank you for your recent confirmation of this matter. We note this matter is now concluded, with SNH confirming that levels of potential disturbance are considerably less than originally thought (as corrected in your response to SSE dated 30/04/14). We will pick up any requirement for monitoring as required through conditions should the wind farm be consented.

Red-throated diver

We note that SNH is concerned with one pair of red-throated divers limited to Loch 64 and flightlines that occurred from this loch to the south during 2012. At present, you have restricted your consideration to the two most recent surveys from 2010 and 2012, in the belief that the 2003, 2004 and 2007 data are irrelevant. For the following reasons, we would ask you to give this issue further thought.

As highlighted in the recent meeting with you and your staff on 25/04/14, our independent ornithology experts noted that whilst in some circumstances breeding and flight activity can change in response to habitat alteration (such as muirburn, afforestation or changes to agricultural practices, which could potentially make older data unrepresentative), this is not the case for divers (as lochans are less prone to such drastic habitat change). This is why the full 2003 to 2012 survey data set was included in the Strathy South Addendum, together with additional desk study data. We are confident that this combination and depth of information provides adequate and appropriate long-term information to characterise red-throated diver flight activity and breeding distribution, beyond reasonable doubt. Importantly, it enables any more infrequent or anomalous patterns of use (i.e. 2012) to be taken into account, which makes the assessment of effects significantly more robust than would otherwise be the case.

We further highlight that the inclusion of the full span of data is entirely in line with SNH advice provided during extensive consultations on Strathy North, i.e. that flight data from all years be included to inform potential collision risk. This is one further reason why the Strathy South Addendum included the full time-span of data. We also remind you that when the 2003 to 2012 data were presented in draft form to SNH, at our original consultation meeting with Andy Douse on 5th December 2012, the full time-span of data was welcomed, and SNH made no mention of potentially restricting its consideration to just two out of the five years of Strathy South information available.

We would therefore urge you to look again at the apparent inconsistency of approach in this instance. One additional point is that Strathy South is in the unique situation of having even more data on local diver flight and breeding activity from the two adjacent Strathy Wood and Strathy North sites, as held by SNH. Both add additional evidence as to the extent, direction and frequency of flights to the north, as well as inter-lochan movements between the three sites. As well as these flight data, the extra breeding survey results identify the areas' regular and intermittent breeding locations, and those where birds have not been recorded.

Therefore, going beyond the already robust dataset for Strathy South, this wider information held by SNH enables an even greater understanding of red-throated diver occupancy rates and breeding distribution in the area.

We would emphasise that in the ten year span of Strathy South data collection, only once has a pair of red-throated divers been confirmed as breeding at Loch 64, (i.e. 2012). Other than this sole confirmed breeding record, there is very little evidence that this particular lochan is used at all by red-throated divers habitually. As part of post-construction monitoring for Strathy North, Loch 64 is being monitored again this year (2014), and up to early May 2014, whilst divers are present at other lochans (Strathy Wood), there is no such activity at Loch 64. If it would be of assistance, we can provide a further up-date when we meet, and whilst we acknowledge it is still early in the breeding season, this early indication continues to confirm the assessment and conclusions presented in the Addendum.

Our understanding is that you hold concerns because of perceived uncertainty caused by the inter-annual variation in use of Loch 64, and the difficulties in observing flights at this one waterbody. In contrast to other moorland species, however, that can commute in any direction to any suitable habitat, red-throated divers from Loch 64 can and will only fly either to other local lochans, or to the sea. The potential permutations of flight directions are therefore limited and are covered by the vantage point work not only from 2010 and 2012, but also in the previous years' surveys (a further reason why this data should not be excluded from consideration). For flight activity to the north and northeast, this is further supplemented by data from Strathy North (2003, 2004, 2007, 2008,2009, 2013) and from Strathy Wood respectively.

To summarise, we would ask SNH to accept that, on reflection, there is more than sufficient information on the flight activity and breeding distribution of this species at and around Strathy South. Overall, based on the current data, we suggest there is in fact a wealth of information supporting the conclusions reached in the Addendum and there would a clear and reliable basis for Ministers to be satisfied that no reasonable scientific doubt remains as to the absence of an adverse effect on site integrity.

Given this position, we remain unconvinced that it would be necessary or appropriate to delete turbines from the project so as to further reduce any impact upon red-throated diver. However, in the interests of trying to find a constructive way forward at this stage, if this is something that SNH would like to discuss further then we would be happy to assist in that regard. For example, you may wish to consider discussing turbine deletion either of any specific turbines that are considered to cause uncertainty, or to create a corridor for the single year's flight paths from this location to accommodate the concerns over this single pair of birds. At Corriemoillie Wind Farm, for example, SNH was able to resolve red-throated diver issues through the identification of a corridor through turbines and has done so for other sites and species using fewer data to inform advice on turbine layout. To assist in this process, our ornithologists can provide predicted collision risk clarifications for turbine deletion scenarios, as we believe these are important to aid discussions around turbine removal as potential mitigation.

Whilst turbine deletion is an option open to the decision-maker based on the information available to them, it would seem reasonable at the forthcoming meeting to engage in a further discussion on this potential option at this stage, as we discussed when we met Andrew Bachell on the 2nd May. We remain confident therefore that with constructive engagement a resolution of this issue can be achieved.

Greenshank

From both the meeting on 25th April 2014 at SNH offices and with Andrew Bachell on 2nd May 2014 at SSE offices, we welcome the fact that SNH have confirmed there is not a requirement to seek further data surveys in relation to greenshank.

However, we remain unclear as to why SNH have considered the application of an 800m buffer as a relevant approach in relation to turbine separation from territory centres, particularly as SNH did not apply this at Strathy North (or at other sites, as far as we are aware).

The origin of SNH's 800m buffer is presumably either (1) the distance used by Hancock *et al.* (1997) as the minimum separation distance between greenshank territories, or (2) that greenshank flight

activity is marked out to approximately 1,000m (the implication being that this is towards the upper limit and therefore that 800m would account for the majority of flight activity).

Of these two options, our ornithologists had already advised that the first was irrelevant because a separation distance between adjacent pairs is not evidence that displacement occurs up to this distance. This is supported by the 2013 post-construction monitoring results at Rosehall that SNH already have access to. Here, greenshank were recorded successfully breeding in 2013 within the Rosehall wind farm, at 100m from an operational turbine. Since all of Strathy South's turbines are well in excess of 100m from greenshank breeding locations (most are 500m or more from any nearest territory centre), we conclude that displacement should not be a concern (please see the Appendix to this letter for the full list of distances between putative territory centres and turbines). SSE's operational wind farm at Achany is adjacent to Rosehall and has also monitored greenshank pre- and post- construction. The combined evidence from both sites (which are just south of the Caithness and Sutherland Peatlands SPA) is compelling and substantial, showing greenshank are not prevented from successfully breeding in and around these operational wind farms, and that collision risk remains extremely low. Our ornithologist advises us that there is no topographical constraints at Rosehall that would prevent this data being used to compare greenshank activity around turbines in relation to Strathy South.

The combined Achany/Rosehall results are in the process of being reported as part of the Achany post-construction monitoring.

Having previously highlighted that an 800m buffer between turbines and breeding territory centres was over-precautionary, we therefore welcome SNH's recent confirmation that displacement of breeding greenshank is no longer a concern. Now that SNH has up-dated its position in this regard, we request that its other concerns on greenshank are also re-examined. Our ornithology experts advise that SNH's position on the risk of collision is over-precautionary and that information is sufficient to demonstrate beyond reasonable scientific doubt that there would be no adverse effect on the integrity of the SPA.

Further in relation to the issue of collision risk, we now wish to respond on the matter of distance detection, and attempts to correct for any such effects. We wish to highlight the following points therefore in relation to collision risk.

That the vantage point surveys carried out at Strathy South to determine flight activity complies with SNH guidance. If SNH holds generic concerns about detection of greenshank we would reasonably have expected resolution of this to be fully dealt with through its guidance. The current advice provided by SNH in the letter dated 30th April 2014 does not appear to be consistent with SNH's own guidance and we would find it useful to discuss this further at the next meeting.

In the same vein, as there is nothing unique about greenshank's vulnerability to disturbance from vantage point surveyors, or the Strathy surveys, it follows that the possibility of reduced flight activity due to surveyor presence is a generic issue related to SNH's recommended survey method. It would therefore affect the results of all vantage point surveys on open moorland, for waders and raptors for example, at all such sites. Therefore, we believe SNH's concerns in relation to this possible effect cannot be justified (unless it is willing to revisit all wind farm casework and change its own guidance to further take account of surveyor disturbance effects). We also note this issue was not raised at Strathy North. Furthermore, in terms of the actual effects of observers on the flight activity of breeding birds

there is a counter- argument that the effect is to increase this in some circumstances. This is particularly the case for many breeding waders (including greenshank), which are likely to alarm-call and display in response to the presence of intruders (whether they be human or other potential predators). This would obviously increase flight activity close to the surveyor, if they were causing disturbance. For all of these reasons, we believe that SNH are incorrect to propose that detection is inhibited by surveyor presence at vantage points, and that it should revisit this concern in light of what has been said above. It is respectfully suggested that a more plausible explanation is that topography (and resulting habitat differences) is the cause of reduced greenshank activity in proximity to vantage points, i.e. that vantage points are generally located on relatively high, drier, ground, which is less suitable for greenshank.

Regardless of the above, we do nevertheless welcome and appreciate the complimentary comments made at the 25th April 2014 meeting by your staff on our bird advisors' analyses of detection rates.

It is also worth re-emphasising that the interpretation of flight detectability analyses that have been undertaken by our ornithological advisors has been done in a highly precautionary manner. Thus, our ornithologists have shown that even assuming levels of flight activity in the reference distance band (250-500m) are twice and four times higher than those that were actually recorded, the end-point collision estimate is still small. It is highly unlikely that flight activity within the reference distance band could have been underestimated to this extent (either through reduced detectability at 250-500m or if there were any observer-disturbance effects), as supported by the fact that there was only an approximate two fold difference in the recorded activity between the reference distance band and the 500-1000m band.

Having therefore re-considered the risk of collision following the ornithologists' meeting on 25th April 2014, our bird specialists confirm that resulting predicted levels of collision risk remain extremely low. Even without any mitigation, these collision rates would self-evidently not prejudice the conservation objectives of the 145,517ha Caithness and Sutherlands Peatlands SPA, whose breeding population across the SPA was given in the SPA citation as 256 pairs, but which was subsequently estimated to be 653 pairs. Even applying the highly unlikely precautionary assumptions, so that doubling the predicted collision rates are doubled or quadrupled, the predicted mortality is only up to 0.12 greenshank a year (one bird every eight years) or 0.24 a year (one bird every four years) respectively. Even on these highly precautionary scenarios, and before taking any mitigation into account, it is entirely clear that the SPA site integrity would not be adversely affected , and that no reasonable scientific doubt remains as to the absence of such effects.

We are pleased that SNH will consider this position subject to a further review of this evidence, including topography, and also from Rosehall and Achany operational wind farms.

I look forward to your reply following this further round of clarifications and would respectively request a resolution of these outstanding matters to allow SSE to meet the June 2014 Highland Council Planning committee, given the historical delays incurred to date.

Finally I would like to record thanks to you and your team's efforts on this project to date. Good progress has been made and I hope we can conclude on this very soon.

I would also ask that you consider the very positive impact on all species in the region that our extensive on and off-site mitigation and enhancement plans will deliver, in particular the removal of

1,000 hectares of sitka as well as the direct production of renewable energy which can help tackle the biggest threat to all species, including humans, posed by climate change.
Yours sincerely

George Baxter

cc.

Andrew Bachell, Operations Director, SNH
Neil Lannen, SSER
Simon Zisman, RPS

Andrew Bachell
Director of Operations
Great Glen House
Leachkin Road
INVERNESS
IV3 8NW

Inveralmond House
200 Dunkeld Road
PERTH
PH1 3AQ

Telephone: 01738 457342
e-mail: george.baxter@sse.com

Date: 19/05/2014

Dear Andrew,

SSE response to Scottish Natural Heritage - Strathy South wind farm Addendum.

Further to our recent correspondence and discussion between the project team and your case officers, and also between Neil Lannen and ourselves, regarding the proposed Strathy South wind farm, I am writing to formally set out and summarise our response on the remaining matters so that Highland Council can complete its report on the project prior to its committee meeting on June 10th 2014.

I understand that you and colleagues are re-examining your assessment in response to our clarifications to your letter of 30th April – and that we may well meet again this coming Wednesday 21st May. Should you be in a position to offer any further clarification by the end of this week to further inform Highland Council's committee report we would welcome this, but if not we will simply move forward on the basis of where we are to date. You will see that I have copied this letter to Ken McCorquodale at the Highland Council and to Nikki Anderson at the Scottish Government, ECDU so that they are aware of the position held by the applicant.

First of all – it is important to note that we are delighted that SNH has now withdrawn 15 of 17 concerns about the wind farm, and we are equally pleased that the remaining issues appear in our view manageable in that they can either be overcome by planning condition, or by an appropriate, justified and reasonable judgement being reached by the decision-maker. We believe the level of information, interpretation and available solutions is more than sufficient for the decision maker to make a judgement in due course.

To summarise our response on the remaining concerns:

Golden eagle

I am pleased that SNH has confirmed no concern remains on the basis of golden eagle and we thank you for your recent confirmation of this matter. We note this matter is now concluded, with SNH confirming that levels of potential disturbance are considerably less than originally thought (as

corrected in the SNH response to SSE dated 30/04/14). We will pick up any requirement for monitoring as required through conditions should the wind farm be consented.

Red-throated diver

We note that SNH is concerned with one pair of red-throated divers limited to Loch 64 and flightlines that occurred from this loch to the south during 2012. At present, you have restricted your consideration to the two most recent surveys from 2010 and 2012, in the belief that the 2003, 2004 and 2007 data are irrelevant. For the following reasons, we asked you to give this issue further thought.

As highlighted in the recent meeting with you and your staff on 25/04/14, our independent ornithology experts noted that whilst in some circumstances breeding and flight activity can change in response to habitat alteration (such as muirburn, afforestation or changes to agricultural practices, which could potentially make older data unrepresentative), this is not the case for divers (as lochans are less prone to such drastic habitat change). This is why the full 2003 to 2012 survey data set was included in the Strathy South Addendum, together with additional desk study data. We are confident that this combination and depth of information provides adequate and appropriate long-term information to characterise red-throated diver flight activity and breeding distribution, beyond reasonable scientific doubt. Importantly, it enables any more infrequent or anomalous patterns of use (i.e. 2012) to be taken into account, which makes the assessment of effects significantly more robust than would otherwise be the case.

We further highlight that the inclusion of the full span of data is entirely in line with SNH advice provided during extensive consultations on Strathy North, i.e. that flight data from all years be included to inform potential collision risk. This is one further reason why the Strathy South Addendum included the full time-span of data. We also remind you that when the 2003 to 2012 data were presented in draft form to SNH, at our original consultation meeting with Andy Douse on 5th December 2012, the full time-span of data was welcomed, and SNH made no mention of potentially restricting its consideration to just two out of the five years of Strathy South information available.

We would therefore urge you to look again at the apparent inconsistency of approach in this instance.

One additional point is that Strathy South is in the unique situation of having even more data on local diver flight and breeding activity from the two adjacent sites Strathy Wood and Strathy North, as held by SNH. In other words SNH should have the knowledge and data available internally as to the extent, direction and frequency of flights to the north, as well as inter-lochan movements between the three sites. As well as these flight data, the extra breeding survey results identify the areas' regular and intermittent breeding locations, and those where birds have not been recorded.

Therefore, going beyond the already robust dataset for Strathy South, this wider information held by SNH enables an even greater understanding of red-throated diver occupancy rates and breeding distribution in the area.

We would emphasise that in the ten year span of Strathy South data collection, only once has a pair of red-throated divers been confirmed as breeding at Loch 64, (i.e. 2012). Other than this sole confirmed

breeding record, there is very little evidence that this particular lochan is used at all by red-throated divers habitually.

Our understanding is that you hold concerns because of perceived uncertainty caused by the inter-annual variation in use of Loch 64, and the difficulties in observing flights at this one waterbody. In contrast to other moorland species, however, that can commute in any direction to any suitable habitat, were red-throated divers to use Loch 64, they could or would only fly either to other local lochans, or to the sea. The potential permutations of flight directions are therefore limited and are covered by the vantage point work not only from 2010 and 2012, but also in the previous years' surveys (a further reason why this data should not be excluded from consideration). For flight activity to the north and northeast, this is further supplemented by data from Strathy North (2003, 2004, 2007, 2008, 2009, 2013) and from Strathy Wood respectively.

To summarise, as you are aware we have asked SNH to accept that, on reflection, there is more than sufficient information on the flight activity and breeding distribution of this species at and around Strathy South. Overall, based on the current data, we suggest there is in fact a wealth of information supporting the conclusions reached in the Addendum and there would be a clear and reliable basis for Ministers to be satisfied that no reasonable scientific doubt remains as to the absence of an adverse effect on site integrity.

Given this position, we remain unconvinced that it would be necessary or appropriate to delete further turbines from the project (in addition to those already identified), so as to further reduce any impact upon red-throated diver. However, in the interests of trying to find a constructive way forward we did indicate that we would be prepared to explore any workable solutions that SNH would like to discuss further. We would be delighted to take that up in due course if necessary. For the current purposes of local authority consultation, however, we are minded to move forward with the development as it stands with regards to red-throated divers, unless of course SNH is able to come back to ourselves and Highland Council before the end of this week with a reviewed position.

Greenshank

From both the meeting on 25th April 2014 at SNH offices and with you on 2nd May 2014 at SSE offices, we welcome the fact that SNH have confirmed there is not a requirement to seek further data surveys in relation to greenshank.

However, we remain unclear as to why SNH have considered the application of an 800m buffer as a relevant approach in relation to turbine separation from territory centres, particularly as SNH did not apply this at Strathy North (or at other sites, as far as we are aware).

The origin of SNH's 800m buffer is presumably either (1) the distance used by Hancock *et al.* (1997) as the minimum separation distance between greenshank territories, or (2) that greenshank flight activity is marked out to approximately 1,000m (the implication being that this is towards the upper limit and therefore that 800m would account for the majority of flight activity).

Of these two options, our ornithologists had already advised that the first was irrelevant because a separation distance between adjacent pairs is not evidence that displacement occurs up to this distance. This is supported by the 2013 post-construction monitoring results at Rosehall that SNH already have access to. Here, greenshank were recorded successfully breeding in 2013 within the

Rosehall wind farm, at 100m from an operational turbine. Since all of Strathy South's turbines are well in excess of 100m from greenshank breeding locations (most are 500m or more from any nearest territory centre), we conclude that displacement should not be a concern. Our ornithologist advises us that there is no topographical constraints at Rosehall that would prevent this data being used to compare greenshank activity around turbines in relation to Strathy South.

Having previously highlighted that an 800m buffer between turbines and breeding territory centres was over-precautionary, we therefore welcome SNH's recent confirmation that displacement of breeding greenshank is no longer a concern. Now that SNH has up-dated its position in this regard, we requested that its other concerns on greenshank are also re-examined. Our ornithology experts advise that SNH's position on the risk of collision is over-precautionary and that information is sufficient to demonstrate beyond reasonable scientific doubt that there would be no adverse effect on the integrity of the SPA.

Further in relation to the issue of collision risk, we responded on the matter of distance detection, and attempts to correct for any such effects. We highlighted the following points therefore in relation to collision risk.

The vantage point surveys carried out at Strathy South to determine flight activity complies with SNH guidance. If SNH holds generic concerns about detection of greenshank we would reasonably have expected resolution of this to be fully dealt with through its guidance. The current advice provided by SNH in the letter dated 30th April 2014 does not appear to be consistent with SNH's own guidance.

In the same vein, as there is nothing unique about greenshank's vulnerability to disturbance from vantage point surveyors, or the Strathy surveys, it follows that the possibility of reduced flight activity due to surveyor presence is a generic issue related to SNH's recommended survey method. It would therefore affect the results of all vantage point surveys on open moorland, for waders and raptors for example, at all such sites. Therefore, we believe SNH's concerns in relation to this possible effect cannot be justified (unless it is willing to revisit all wind farm casework and change its own guidance to further take account of surveyor disturbance effects). We also note this issue was not raised at Strathy North. Furthermore, in terms of the actual effects of observers on the flight activity of breeding birds there is a counter- argument that the effect is to increase this in some circumstances. This is particularly the case for many breeding waders (including greenshank), which are likely to alarm-call and display in response to the presence of intruders (whether they be human or other potential predators). This would obviously increase flight activity close to the surveyor, if they were causing disturbance. For all of these reasons, we believe that SNH are incorrect to propose that detection is inhibited by surveyor presence at vantage points, and that it should revisit this concern in light of what has been said above. It is respectfully suggested that a more plausible explanation is that topography (and resulting habitat differences) is the cause of reduced greenshank activity in proximity to vantage points, i.e. that vantage points are generally located on relatively high, drier, ground, which is less suitable for greenshank.

Regardless of the above, we do nevertheless welcome and appreciate the complimentary comments made at the 25th April 2014 meeting by your staff on our bird advisors' analyses of detection rates.

It is also worth re-emphasising that the interpretation of flight detectability analyses that have been undertaken by our ornithological advisors has been done in a highly precautionary manner. Thus, our ornithologists have shown that even assuming levels of flight activity in the reference distance band

(250-500m) are twice and four times higher than those that were actually recorded, the end-point collision estimate is still small. It is highly unlikely that flight activity within the reference distance band could have been underestimated to this extent (either through reduced detectability at 250-500m or if there were any observer-disturbance effects), as supported by the fact that there was only an approximate two fold difference in the recorded activity between the reference distance band and the 500-1000m band.

Having therefore re-considered the risk of collision following the ornithologists' meeting on 25th April 2014, our bird specialists confirm that resulting predicted levels of collision risk remain extremely low. Even without any mitigation, these collision rates would self-evidently not prejudice the conservation objectives of the 145,517ha Caithness and Sutherlands Peatlands SPA, whose breeding population across the SPA was given in the SPA citation as 256 pairs, but which was subsequently estimated to be 653 pairs. Even applying the highly unlikely precautionary assumptions, so that the predicted collision rates are doubled or quadrupled, the predicted mortality is only up to 0.12 greenshank a year (one bird every eight years) or 0.24 a year (one bird every four years) respectively. Even on these highly precautionary scenarios, and before taking any mitigation into account, it is entirely clear that the SPA site integrity would not be adversely affected, and that no reasonable scientific doubt remains as to the absence of such effects.

Finally I would like to record thanks to you and your team's efforts on this project to date. Good progress has been made to date and, as indicated, we would be very happy to meet again in order to assist SNH with its further consideration of the issues identified above.

Yours sincerely

George Baxter

cc.

David Mackay, Operations Manager, SNH Golspie Office,
Ken McCorquodale, Highland Council
Nikki Anderson, Scottish Government ECDU
Neil Lannen, SSE
Simon Zisman, RPS

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

Mr George Baxter
SSE
Inveralmond House
200 Dunkeld Road
Perth
PH1 3AQ

23 May 2014

By email to: george.baxter@sse.com

Dear Mr Baxter,

Strathy South wind farm addendum – Red-throated diver and greenshank

Thank you for your letter of 15 May 2014 summarising your response with respect to red-throated diver and greenshank. You raise a number of issues and I will deal with each in turn below.

Caithness and Sutherland Peatlands SPA
a. Red-throated diver
We agree that at the meeting on 5th December 2012 we did consider the full time span of data to be useful and did not suggest restricting it to the two years 2010 and 2012. We also advised at the meeting and in a subsequent email to Simon Zisman, that our final view would depend on seeing the full Environmental Statement (ES) along with the detail of all vantage points, the hours watched and other survey information. We received the full ES in July 2013.

Survey data and flight lines. We consider that the survey data from 2010 and 2012 are *more* relevant than the older observations from 2003, 2004 and 2007. There are several reasons for this:

- Flightlines may well have changed over the years; tree growth and changes in prey abundance could, for instance, affect this. As a result we do not share SSE's confidence that the older flight activity data will necessarily be representative of current patterns of use.

- 2010 and 2012 are the only years in which diver watches were carried out from Vantage Point (VP) 11, which is close to loch 64 and affords views over most of the water surface. Vantage points used in other years were very far from optimal given their extended distance from loch 64 and impairment of views by trees. We consider that a significant proportion of diver flights may have been missed, especially from VPs other than VP 11.

We disagree with the assertion that 2012 – the year of proven breeding at loch 64 – represents an 'infrequent or anomalous pattern of use'. Excluding the present breeding season, loch 64 has been checked for breeding divers four times since 2003, with at least one bird present in three of those years. The breeding status of divers at loch 64 is not known in the years when it was not surveyed. The assertion that 'there is very little evidence that this particular lochan is used at all by red-throated divers habitually' appears to confuse *absence*

of evidence with *evidence of absence*. Loch 64 appears to be entirely suitable as a breeding site for red-throated diver.

We do not agree that survey work carried out for Strathy North and Strathy Wood wind farms tells us anything very specific about diver flight activity, preferred flight lines or collision risk at loch 64. These other wind farm sites are too distant to inform our assessment of divers using loch 64.

It is suggested that '*the potential permutations of flight directions are … limited'*, but if divers are using sites other than the coast for foraging then a wide range of flight line directions are possible.

There is no empirical evidence that flight line corridors are an effective mitigation measure for red-throated divers at wind farms. Corriemoillie is mentioned as using such corridors as mitigation, but this is a site where red-throated divers were not a qualifying feature of a Special Protection Area (SPA), and there is less need for certainty of effectiveness.

We do not recommend that 'collision risk clarifications for turbine deletion scenarios' are undertaken. The existing data do not support this depth of analysis. It is our view that insufficient dedicated vantage point survey has been undertaken for loch 64 which places little confidence in the flight lines presented as providing a comprehensive picture of diver movements. Diver flights would normally be expected to be between the breeding loch and the coast, but the flights presented for loch 64 deviate from this normal pattern. It is therefore not possible to provide advice on turbine deletion as mitigation.

We advised in our letter of 30 April that additional vantage point work to inform a robust assessment of flight activity rates and flight directions for loch 64 should be carried out. We acknowledge that loch 64 is not used in every year by breeding red-throated divers, so further survey work may not be of help unless the divers are present.

In light of no new information being presented, we maintain our objection with respect to red-throated diver.

b. Greenshank

The 800m buffer. In our letter of 30 April we explain that the approach taken in our original response was to define a buffer distance (800m) around putative territory centres which would, in our estimation, reduce the potential for interaction with the turbines and therefore collision risk. This would involve removal or moving turbines.

The figure of 800m is used by Hancock (1997) as a minimum separation distance between greenshank pairs, and looking at the greenshank territory registrations, mean separation distances <u>appear</u> to fall within this distance band. Secondly, and perhaps more importantly, flight activity is marked (even accounting for distance detection) out to about 1,000m.

We reiterate that the buffer is not a displacement distance. We accept that the limited evidence suggested that greenshank show limited avoidance of turbines, but this may make them more vulnerable to collision with turbines. There are two subsidiary caveats to this:

- There may be over-reliance on monitoring outcome from one operational site and site under construction. Evidence for other species (e.g. golden plover) suggests that displacement may not be an issue at sites under construction and/or operational wind farms but this is not necessarily seen at every site.

- More importantly, temporal effects cannot yet be discounted. Long term monitoring may show displacement as existing territory holders die and new birds adopt their own breeding territories. Many waders are strongly attracted back to previous nesting locations, so

displacement may not be evident for some years. The same may not hold true for newly recruited birds. We believe that evidence from Gordonbush wind farm monitoring (relating to golden plover) may support this suggestion.

Given this, the recommendation for an 800m buffer rests on reducing (and therefore mitigating) collision risk.

Distance detection and collision risk. We have argued in our letter of 30 April that issues surrounding distance detection mean that flight activity is under-recorded. We fully understand why an attempt has been made to correct for this. The method is, in principle, sound but as we pointed out in the meeting held between SNH, RPS and SSER on 25th April, the nature of the correction for observer effect depends on the form of the distance detection function and the assumption that this follows a half-normal distribution does not necessarily hold true for all species. Given that, the true level of flight activity cannot be estimated with the necessary accuracy, which implies that collision risk calculations rest on unsound assumptions.

Observer effects and habitat effects. It is argued that the low level of flight activity is a result of habitat effects but no substantive evidence is provided to that effect. At the meeting on 25th April we explained that for the magnitude of the reduced reduction in flight activity near to VPs, the habitat effects needed to be reasonably consistent between VPs, yet there was no good evidence that this was the case. In contrast the strong effect shown is consistent with other studies showing observer effects (e.g. whimbrel in Shetland). In addition the idea that activity might <u>increase</u> close to an observer due to attraction (we assume) is flawed. There are two reasons for this:

- Our guidance states that observers at VPs should have a settling in period when they first arrive, to limit the effects of observer disturbance. Reaction to visible, moving surveyors is quite different to stationary, concealed observers.

- Secondly, greenshank individuals actively fly <u>away</u> from any disturbance, which would be entirely consistent with low levels of flight activity close to VPs. We agree that behaviour is not consistent between species and in contrast whimbrel appear to behave very differently.

In summary, we do not believe that the distance effect detected (using the Generalized Linear Mixed Model analysis) can be solely attributed to habitat or topography effects, but are more likely to rest on displacement caused by the surveyor.

SNH guidance. We are not clear why the issue of our guidance is being raised now. Our guidance has always made it clear that it is not prescriptive and that developers and contractors need to adapt and develop survey methodology to particular sites. Some sites will require survey work to a much higher specification than others, something the guidance cannot reasonably encapsulate other than through a requirement for developers, consultants and SNH to develop suitable site-specific methodology.

Collision risk estimates and the SPA greenshank population. The arguments presented rest on the conclusion from Collision Risk Modelling that greenshank collisions will be sufficiently low (i.e. rare) and therefore the SPA population will not be affected. However, this understates the importance of the following:

- That collision risk estimated may be considerably underestimated (as discussed above), both alone and in combination with other plans and projects across the Caithness and Sutherland Peatlands SPA.

- That the habitat around Strathy South forest includes some of the best wader breeding habitat with high densities of all species, including greenshank. Using RPS data, it is

calculated that in 2010 16 greenshank territories lie within 800m of the nearest turbine (any one territory centre may be within 800m of more than one turbine). In 2012 the comparable figure is 15 greenshank territories. By comparison, at Achany in 2003, up to four pairs of greenshank were found to breed close to the proposed development site (Achany Environmental Statement, Chapter 10, *2005*).

- That numbers quoted for both the original SPA and the subsequent monitoring are hedged with large confidence intervals which only suggest that the population may be stable or *possibly* increasing.

- That a careful consideration of all the conservation objectives for the Caithness and Sutherland Peatlands SPA for greenshank as a qualifying interest, do not show, beyond reasonable doubt, that the integrity of the SPA will *not* be adversely affected.

Rosehall and Achany wind farms. We would like to reassure you that our assessment did take account of evidence provided in the ES Addendum from work undertaken at Rosehall and Achany. We also took account of work on greenshank undertaken for the Lewis wind farm (this information is summarised in the HRA and in the public domain – see www.scotland.gov.uk/Resource/Doc/917/0059429.doc). We agreed at the meeting on 25 April to look at new information from post construction work, but this information has to date not been provided.

In light of no new information being presented, we maintain our objection with respect to greenshank.

Conclusion
We would be happy to consider any new information relating to impacts on red-throated diver and greenshank arising from the proposed development at Strathy South, which would cause us to revise our assessment of the likely impacts. Until then our position on red-throated diver and greenshank is maintained i.e. objection.

Please let me know if you need further information or advice in relation to this proposal.

Yours sincerely,

David Mackay
Operations Manager
Northern Isles and North Highland

c.c. Neil Lannen, SSE
Simon Zisman, RPS
Ken McCorquodale, Highland Council, Planning
Nikki Anderson, Scottish Government, ECDU

Kate Lyon

Subject: Strathy South Wind Farm
Attachments: ecdu letter 060614.pdf; Strathy South - Appendix to ECDU letterFINAL.pdf; sec7232 _Strathy_2km_Viewshed_at_20m_1_2.pdf; ATT00003.txt; ATT00001.txt

From: George Baxter [mailto:george.baxter@sse.com]
Sent: 19 August 2014 12:21
To: Andrew.Bachell@snh.gov.uk
Cc: Simon Zisman; Dave Mackay; Nicki Small
Subject: Strathy South Wind Farm

Dear Andrew

I am writing following our letter of 6th June 2014 to the Energy Consents and Deployment Unit (attached). We have, to date, received no response to this correspondence from SNH (although it was copied to yourself and Dave Mackay and related to points previously raised by SNH).

To move matters forward we are conscious that ahead of the pre-inquiry meeting for the Strathy South public inquiry it will be expected that key parties to have made every reasonable effort to agree areas of common ground, so that the inquiry can focus on remaining areas of contention.

We therefore request a meeting with SNH, to obtain your clarification and agreement on the following matters in relation to greenshank:

1. The method to determine greenshank territory centres
2. Greenshank habitat relationships

If you could please let me know the soonest opportunity that it would be possible to meet, that would be appreciated.

Kind Regards

George

George Baxter
SSE Renewables

T: 07825 015184 www.sse.com

Nikki Anderson,
Energy Consents & Deployment Unit
Scottish Government
4th Floor, 5 Atlantic Quay
150 Broomielaw
Glasgow
G2 8LU

SSE Generation Ltd
Inveralmond House
200 Dunkeld Road
PERTH
PH1 3AQ

Telephone: 01738 457342
e-mail: george.baxter@sse.com

Date: 06/06/2014

Dear Nikki,

SSE Generation Ltd ("the Applicant") response to the ECDU on Resolution of the Two Remaining Scottish Natural Heritage (SNH) Concerns on the Strathy South Wind Farm Application for Section 36 Consent

Following recent exchanges with SNH, I am writing to up-date the ECDU on the Applicant's position regarding the two residual objections from SNH to the Strathy South windfarm application. This letter summarises the key points in relation to the Applicant's position, and the enclosed Appendix expands on these in more detail. The Appendix also responds directly to matters raised by SNH in their letter dated 23rd May 2014.

As you are aware, subject to specific conditions, SNH has no remaining natural heritage objections (either on any habitats, protected species, or bird issues), other than what it considers to be possible uncertainty over theoretical predicted collision risk to two qualifying species of the Caithness and Sutherland Peatlands SPA. Specifically this relates to one pair of red-throated divers in the rare circumstances that these birds breed at one particular lochan, and to collision risk for local greenshank. SNH has recently stated its position in a letter to the Applicant dated 23 May 2014, also copied to ECDU.

In light of SNH's uncertainties, the Applicant wishes to re-iterate that the Addendum thoroughly assessed the potential impacts from the proposed windfarm on both of these species, in considerable detail, and for all phases of the proposed project, through construction, operation, and decommissioning. As part of this in-depth assessment, the Applicant's detailed consideration also took into account the complementary investigations completed for Strathy North windfarm (now under construction), as well as experience from other sites, (under construction and operational) including relevant projects in the Applicant's renewable energy portfolio. The potential impacts on all species were also assessed from the project itself, and in combination, using this combined fully comprehensive data, benefitting from on-the-ground practical knowledge of bird interactions with windfarms. The information provided is therefore robust and able to inform the Appropriate Assessment.

The analysis that was completed for Strathy South included a number of precautionary assumptions and concluded beyond reasonable scientific doubt, for all qualifying species of the Caithness and Sutherland SPA, that there would be no adverse impact on the SPA's integrity, alone or in combination with other plans and projects.

Red-throated divers

The Addendum examined flight activity across the site, monitoring five years over the 2003 to 2012 period, and concluded that, using a precautionary 98% avoidance rate, without mitigation, one red-throated diver collision

was theoretically predicted to occur every 5.4 years (0.19 birds per year). This would equate to 0.18% of the 2006 estimated population of 39 pairs and 13 non-breeding individuals for Caithness and Sutherland (Dillon et al. 2006), which is in favourable conservation status.

Losses at this level are not considered a significant addition to background levels of mortality, even before the deployment of mitigation measures. Furthermore, it is reasonable to consider that such losses of breeding birds would be replaced from the non-breeding population. The combination of the low predicted theoretical collision risk and this replacement capacity, combined with the precautionary assumptions incorporated into the collision risk modelling, enabled the conclusion to be reached in the Addendum that there would be no impact on the SPA's breeding red-throated diver population viability, and consequently for no adverse impacts on site integrity arising from this species.

SNH's residual objection concerns uncertainty over the theoretical predicted collision risk to red-throated divers using one non-SPA lochan inside the site. However, significant flight activity at this lochan was only recorded in one year out of the five that were monitored between 2003 and 2012. The comprehensive data collected on red-throated diver breeding distribution on and around Strathy South, which extended significantly beyond what is required by SNH guidance, confirmed breeding at Loch ID 64 is extremely infrequent, and that there are alternative breeding lochans in proximity, within the SPA, where the pair could successfully nest.

Whilst confident in the Addendum's findings and whilst precautionary assumptions were built in to the assessment process, potential additional mitigation measures were identified in the Addendum to further reduce the risk of any impact ever occurring on this species, at Loch ID 64, to address the extremely infrequent eventuality of it breeding there. As this lochan is outside the SPA, the mitigation measure proposed was the mooring of buoys across the surface of the lochan to prevent divers attempting to breed. The Applicant considers this to be a pragmatic and achievable mitigation measure should SNH continue to have residual concerns about flight activity levels associated with this lochan. With this mitigation in place, the potential collision risk would drop further below the above levels, providing an additional level of safeguard, if required.

SNH have indicated, to date, that this mitigation would not be desirable, but have not given an explanation of why this would be the case. This is unsupportable in the Applicant's view. The Applicant is also aware that SNH is supporting the EU funded LIFE project, removing forest and forest brash to enable peatland restoration, despite the fact that brash habitat has supported breeding hen harrier and is adjacent to the Caithness and Sutherland Peatland SPA.

This contrasts markedly with its feedback on the precautionary deployment buoys on Loch ID 64, which is an unexceptional water body that is only infrequently used for red-throated breeding, and that would only infrequently potentially displace one pair of divers therefore, for which there are demonstrably alternative nesting locations in the adjacent SPA.

The Applicant therefore highlights the additional fail-safe proposed red-throated diver mitigation for this Loch ID 64, to further counter any uncertainty over risk from collision is a pragmatic and an acceptable mitigation measure, given that there are known local alternative breeding sites, as stated.

To further assist red-throated divers, provision of rafts for breeding divers within the SPA was also proposed in the Addendum. It is certainly acknowledged that research has not, to date, been carried out to demonstrate empirically that rafts increase breeding success specifically for red-throated divers (in the way that there is for black-throated divers), and SNH has pointed this out. Nonetheless, it is well within the realms of ecological

reasoning that the rafts could help reduce predation to an extent, by partially limiting accessibility of nests to foxes and pine marten.

Greenshank

The Addendum examined flight activity at Strathy South, monitoring five years over the 2003 to 2012 period. Additional complementary monitoring was also carried out off-site, at an operational windfarm of the Applicant (Achany) and deforested peatland (Forsinard), in order to further characterise greenshank flight activity patterns. Based on this comprehensive data set, the Addendum concluded that prior to any mitigation, the predicted theoretical collision rate was 0.12-0.15 birds a year, taking into account an adjustment for distance detection[1]. This is equivalent to one potential collision every 6-8 years, or 0.01% of the SPA population, based on the recent SPA estimate of 653 pairs (1,306 birds). Whilst these results incorporated a degree of precaution, SNH sought additional clarification of distance detection effects, and the Applicant has provided these clarifications. Even if the further precautionary predicted theoretical collision rate was multiplied eight-fold to cover any residual analytical uncertainty, the predicted number of birds is still under 0.5, or 1 every 2 years. Taking it to a further extreme, multiplying by 16 fold would theoretically amount to 1 bird a year.

This extremely low collision risk, which includes multiple precautionary assumptions, further confirms the conclusion of the Addendum that there would be no significant impact on the SPA's breeding greenshank population viability, and consequently no adverse effect on site integrity arising from the impact upon this species. It seems inexplicable that SNH has on-going concerns over predicted theoretical collision risk to greenshank, and perplexing that it is focusing on analytical matters when it is evident that even without any mitigation, there is no impact on the SPA's site integrity from potential collision risk from the proposed windfarm itself or in combination with other plans and projects. The fact that SNH is requesting a different analytical approach to its requirement for Strathy North is also of concern.

In light of the above, and notwithstanding the position thus far adopted by SNH, the Applicant remains keen to try and resolve SNH's residual concerns, and it may be that ECDU would wish to convene a meeting with SNH with this purpose in mind.

Yours sincerely

George Baxter

cc.
David Mackay, Operations Manager, SNH Golspie Office
Andrew Bachell, Operations Director, SNH
Ken McCorquodale, The Highland Council
Neil Lannen, SSE
Nicki Small, SSE
Dr. Simon Zisman, RPS
Dr. Murray Grant, RPS
Simon Coote, Head of Energy Consents and Deployment Unit

[1] The tendency for an object to be more difficult to detect the further away it is. Although SNH guidance on bird monitoring for windfarms does not request an adjustment to take this into account, the applicant have nonetheless provided SNH with adjusted figures, in response to its request to do so.

Appendix

Introduction

The purpose of this appendix is to set out the detailed technical background drawn from the application which supports the position set out in the letter to ECDU dated 6 June 2014.

The Applicant's assessment of SNH's remaining red-throated diver and greenshank concerns is that they ought to be capable of being resolved through further discussion, in particular because SNH's current position either:-

- goes above what is required to prove beyond reasonable scientific doubt that there will be no adverse effect on the integrity of Caithness and Sutherland SPA;
- relates to generic issues inherent to SNH's own guidance, and therefore of no particular individual relevance to Strathy South;
- is demonstrably over-precautionary; or
- ignores the scope to remove any risk of any impact on red-throated divers that could evidently be achieved by an appropriate condition.

Below therefore, with the assistance of their expert ornithological advisors RPS, the Applicant presents further detailed clarification in response to SNH's letter of 23rd May 2014. The Applicant would welcome further engagement with SNH, so that the clarifications provided below can be discussed and resolution sought upon any remaining issues.

Red-throated diver

Time span of data
The Applicant highlights to Scottish Ministers that SNH now acknowledge that all years of data stretching back to 2003 are relevant and useful. This counters their previous advice, which sought to restrict the span of data to two of the five years available. SNH's latest and modified position now tallies with its pre-submission feedback on 5th December 2012, is consistent with advice on Strathy North windfarm, and is more ecologically logical and robust. The Applicant therefore welcomes this change in approach by SNH[1].

Given that SNH has accepted that the full timespan of data should be considered, the Applicant reiterates that on the basis of this comprehensive data the Addendum concluded, beyond reasonable scientific doubt, that the level of additional theoretical predicted mortality will not have a significant adverse impact on this qualifying species.

SNH do attempt to argue that older flight observations from 2003, 2004 and 2007 are potentially less relevant, and give two examples of why this might be the case.

[1] The Applicant wishes to highlight that the 5th December 2012 meeting with SNH itself took several months to secure, due to time constraints on SNH staff. Whilst detailed feedback was not anticipated from that meeting given that (in accordance with SNH guidance), pre-submission consultation was intended to get broad feedback on potential sensitivities). SNH's response subsequent to that meeting right up to submission in July 2013 failed to provide any such meaningful feedback or guidance on ornithology reasonably sought by the Applicant at that time.

It is suggested that prey availability could change. It is agreed this could theoretically be the case in coastal waters (where red-throated divers typically feed) or on lochans (which some birds may use less frequently). Firstly, however, the fact remains that the only options for foraging are the coast or larger lochans, so the range of flight directions will remain unchanged, regardless of prey availability. Secondly, SNH fail to give any evidence to demonstrate that prey availability has increased or decreased over time, so the point they raise is entirely hypothetical, and has no actual grounding. SNH also fail to present any evidence to show that flight activity would differ significantly in response to such changes.

Regardless of these shortcomings, it is true that such potentially shifting conditions, and other typical environmental and anthropomorphic variables (such as predator abundance or recreational disturbance from fishermen, for example) are normal potential fluctuations. The key point of using a longer time-span of data is that it gives a greater opportunity for any such inter-annual changes to be recorded and taken into account in the impact assessment. This is good practice and increases the robustness of the assessment, and would not invalidate use of the full 2003 to 2013 dataset, as SNH previously indicated.

With regards to SNH's point that 'tree growth' may affect flight lines, as trees mature, we certainly agree that where trees tightly surround an otherwise suitable diver lochan, increasing tree height over many years could gradually inhibit flight access and therefore use of a lochan. RPS examined this possibility at the Addendum stage by assessing the distribution of potentially suitable lochans across the site from pre-afforestation historical maps, assessing the tree planting distances from waterbodies and considering previous, current and predicted tree height. This concluded that the potential for flight changes as a result of tree growth was not a significant environmental variable at Strathy South over the 2003 to 2013 period. In the longer term, it is possible that some degree of influence could arise at Loch 64 for Strathy South, and potentially decrease the suitability of the lochan and flight activity (thus relocating activity) , but this would depend on tree growth rates and also wind throw. It is incorrect, however, to assert that tree growth at Strathy South over the 2003 to 2013 period would have acted to make the 2003 to 2007 data less relevant.

As highlighted therefore, the Applicant welcomes SNH's revised approach and agrees that the 2003 to 2007 data is of value and relevance to the assessment.

Survey data and flight lines

In response to the points on vantage point coverage of Loch 64, we wish to highlight concerns, firstly in relation to the application of SNH guidance, and secondly the focus on coverage of Loch 64 itself.

SNH raise concerns that vantage points used 'were very far away from optimal given their extended distance from Loch 64'. The Applicant would highlight the fact that for several VPs, the loch falls within the required 2km viewshed, which is as stipulated by SNH guidance. Secondly, when the Applicant and RPS previously met SNH on 25th April 2014, SNH highlighted that part of the concern on flight delectability was that views from vantage points could potentially be impaired by trees, in that divers could be flying against a backdrop of forests, causing SNH to believe they were potentially harder for surveyors to detect. In response, it respectfully appears to the Applicant that these are extremely tenuous lines of reasoning, and wish to highlight again that SNH guidance does not stipulate that vantage points must be selected to avoid views being set against a background of forest (or equally open moorland). Such a stipulation would in fact be highly problematic in any case, as the majority of vantage points used for Scottish windfarm monitoring have been on hill tops or ridges, and therefore

such views across to potential windfarm sites will, in a high proportion of cases, include significant forest or moorland areas. In the Applicant's view therefore, if any restrictions do exist, these are not particular in any way to Strathy South, but instead apply in general to windfarm vantage point surveys. It is not therefore relevant, reasonable or appropriate for SNH to put this issue forward as a particular cause of uncertainty over flight detection at Strathy South.

SNH has apparently reached the erroneous conclusion, on the basis of such views, 'that a significant proportion of diver flights may have been missed, especially from VPs other than VP 11'. SNH make this sweeping assumption without any supporting evidence. Instead they assume that because Loch 64 is towards (albeit within) 2km of certain vantage points, and because some flights would potentially (depending on flight height) be against a forest backdrop, that flight activity was significantly under-recorded, and to such a degree that it is not possible for them to engage constructively on finding a solution to theoretical collision risk. This is unsupportable in the Applicant's view.

In light of SNH's recent correspondence, the Applicant therefore wishes to highlight that SNH has been unwilling to further explore flight activity patterns in detail. As SNH has now accepted the relevance of the full 2003 - 2012 time span of flight data, it is particularly important that the Applicant and RPS are provided further opportunity to meet SNH, and to constructively address SNH's perceived uncertainty over flight activity at this lochan.

As previously highlighted, and reinforced by the accompanying compilation of vantage point viewsheds (compiled from data already presented in the Addendum), coverage of the air space encircling Loch 64, and to and from all potential feeding areas, has been comprehensive, encompassing all points of the compass. Furthermore, the Applicant highlights again that the only actual risk is the potential for flights to the south, which is covered in data for 2003, 2004, 2007, 2010 and 2012.

In response to SNH's related point about the benefit of flight activity and breeding surveys covering Strathy North and Strathy Wood, we simply do not agree that these sites are too distant to provide contextual information on preferred flight lines to and from Loch 64. They are both well within the species' foraging range, and inform comparative patterns of flight between lochans, specifically to the northwest, north and northeast.

It is known from published literature that larger lochans can be used by red-throated divers for foraging, so there are (in contrast to SNH's assertion) only a limited range of directions from Loch 64 to these, specifically either to the north (covered by Strathy South and Strathy North vantage points), southwest, south or southeast (all covered by Strathy South vantage points).

Furthermore, if SNH's concerns over flight detection are to be considered rational and appropriate, there are straightforward mechanisms to address this, i.e. to apply a range of reasonable multipliers to the theoretical predicted collision risk (based on observed data) to take account of any potential risk of under-recording. SNH has accepted this approach elsewhere for other species (such as peregrine falcon in relation to windfarm development adjacent to the Muirkirk and North Lowther Uplands SPA, where the cited SPA breeding population of this species is 29.2 females).

To summarise therefore, in relation to flight activity, we re-iterate that SNH has ignored the fact that potential permutations of flight directions are indeed limited, the fact that viewsheds

comprehensively cover all potential feeding directions from Loch 64, and that divers travelling to and from these foraging sites cross in relatively close proximity (frequently <1km) to at least one or more vantage points. SNH has also ignored the fact that a pragmatic and previously used approach does exist to take account of any additional precaution required, through applying a multiplier to the modelled theoretical collision risk. In combination therefore, on the basis of the expert advice from RPS, the Applicant firmly considers SNH's position to be untenable, and therefore respectfully invites re-examination of SNH's position and constructive engagement to resolve outstanding issues.

Frequency of breeding at Loch 64

In relation to SNH's point about the frequency of use of Loch 64, as highlighted in the Addendum, no breeding red-throated divers were recorded in 1994, during the national survey (which included coverage of Strathy South, and which, as far as we have been able to confirm to date, was the earliest definite survey coverage of the site). There was no breeding recorded in 2003, or 2004, or in 2006, when Loch 64 was covered by the subsequent national diver survey, with a single bird observed once in this latter instance. Given that in 2006, only a single bird was recorded on one visit, the likelihood of possible breeding that year is considered low. There were no divers recorded in 2007, and although a pair was present in 2010, no breeding activity was recorded. In 2012, a pair were seen copulating, and two empty nest scrapes were found. So over these seven years (1994, 2003, 2004, 2006, 2007, 2010, 2012) of definite survey coverage, there was only **one confirmed breeding occurrence**. In considering the data, what gives particular confidence in determining use of Loch 64 is infrequent is that it was also covered during the other breeding surveys that were carried out in those years, notably during breeding raptor and moorland bird visits. Therefore, the Loch would have been covered comprehensively through each breeding season. In combination with the flight activity results, the Applicant maintains the view that it is an extremely irregular breeding site, and it is also clear that there are alternative nesting lochans available in the SPA that are far more frequently and consistently used.

Finally we note SNH's comments in relation to further surveys. We respectfully wish to correct their assertion that if further surveys revealed absence of divers using Loch 64, this 'may not be of help' in relation to flight activity. In contrast, the Applicant wish to highlight that absence of divers would be valuable evidence in fact, because it adds additional weight to the reasonable conclusion in the Addendum that use of the lochan by breeding divers is an infrequent anomaly, and it would demonstrate that confirmed breeding had only taken place one year out of seven, rather than one year out of six.

Potential additional mitigation identified in the Addendum

Whilst the Applicant is entirely confident in the Addendum's findings, and whilst there also being precautionary assumptions built in to the assessment process, potential mitigation measures were identified in the Addendum, to further reduce the risk of any impact ever occurring on this species at Loch 64. The Addendum therefore proposed specifically mooring buoys to prevent divers breeding at this location (buoys are used elsewhere, for example, to prevent wildfowl nesting on water bodies near airports, where they might create a hazard to aircraft, or discouraging birds where they could be detrimental to water quality). The lochan is small and narrow (with maximum approximate dimensions of 192m by 35m), so this would be simple and effective to implement (comparable to putting lines of floats across a 50m swimming pool). Loch 64 is not within the SPA and has only supported confirmed breeding by SPA-associated red-throated divers very infrequently. Furthermore, the 2003 to 2012 breeding diver monitoring has confirmed there are several alternative suitable

breeding lochans in close proximity within the SPA, so that any displaced birds would evidently have alternative nesting locations available.

With this mitigation in place, the potential collision risk would drop further below the above levels, providing an additional level of safeguard, if required.
Whilst SNH have, to date, indicated that this mitigation would not be desirable, as stated within the covering letter to this appendix, the Applicant is aware that SNH is supporting the EU funded LIFE project, removing forest and forest brash to enable peatland restoration, despite the fact that the brash habitat has supported breeding hen harrier and is adjacent to the Caithness and Sutherland Peatland SPA.

The Applicant considers the proposed red-throated diver mitigation for Loch 64 to be a pragmatic and acceptable mitigation measure, given that (a) it is an extremely irregular breeding site, (b) it would only potentially displace one SPA-associated pair out of a breeding SPA population of 39 pairs (Dillon et al. 2006), and (c) that there are known local alternative breeding sites within the SPA, as stated. Should SNH have any residual concerns over Loch 64 therefore, the Applicant respectfully suggests these could readily be dealt with through the mitigation proposed in the Addendum.

The Applicant also considers that SNH have been unduly dismissive of deployment of diver rafts as a further potential mitigation or enhancement measure. Whilst it is acknowledged that no research has been carried out to date to demonstrate empirically that rafts increase breeding success specifically for red-throated divers, it is entirely plausible on the basis of informed ecological reasoning that rafts could help reduce mortality from predation, by partially limiting accessibility of nests to foxes and pine marten. The Applicant respectfully requests therefore that SNH re-considers its position in regard to deployment of rafts.

Greenshank

In relation to greenshank, SNH re-states that its basis for proposing an 800m buffer around putative greenshank territory centres is that (i) it is the criterion used by Hancock et al. (1997) to establish a minimum separation distance between putative greenshank pairs for the purposes of interpreting survey registrations, and (ii) that flight activity remains marked out to c.1000m (with the latter of these two reasons being considered as the most important).

As indicated in our letter to SNH of 19 May 2014, the Applicant does not believe that the first of these reasons (i.e. the Hancock et al criterion) provides justification for an 800m buffer because the data does not refer in any way to flight activity, and the separation distance between adjacent territories will not necessarily equate to the distance at which flight activity from territory centres remains high. Furthermore, the 800m separation distance is simply an objectively based 'rule of thumb' devised by Hancock et al. to enable consistent interpretation of survey data and has no underlying data on actual nest distributions to underpin it.

In terms of the second (and most important) reason for proposing an 800m buffer, SNH consider that flight activity is marked out to c.1000m. Aside from the fact that SNH have not provided evidence in support of this view, SNH suggest that this equates to there being a significant theoretical risk of potential collision out to 800m from putative territory centres. The range of evidence presented in the Addendum and subsequent clarifications has already demonstrated that this risk is absolutely negligible in population terms.

It is also important to note that the territory distribution presented in the Addendum has precautionary assumptions included, and there are also additional precautionary assumptions built into the Hancock et al. method of population interpretation. Despite these precautionary interpretations, the Applicant understands that turbine distances from territories are significantly greater than where greenshank (and other waders) have successfully bred in proximity to operational turbines.

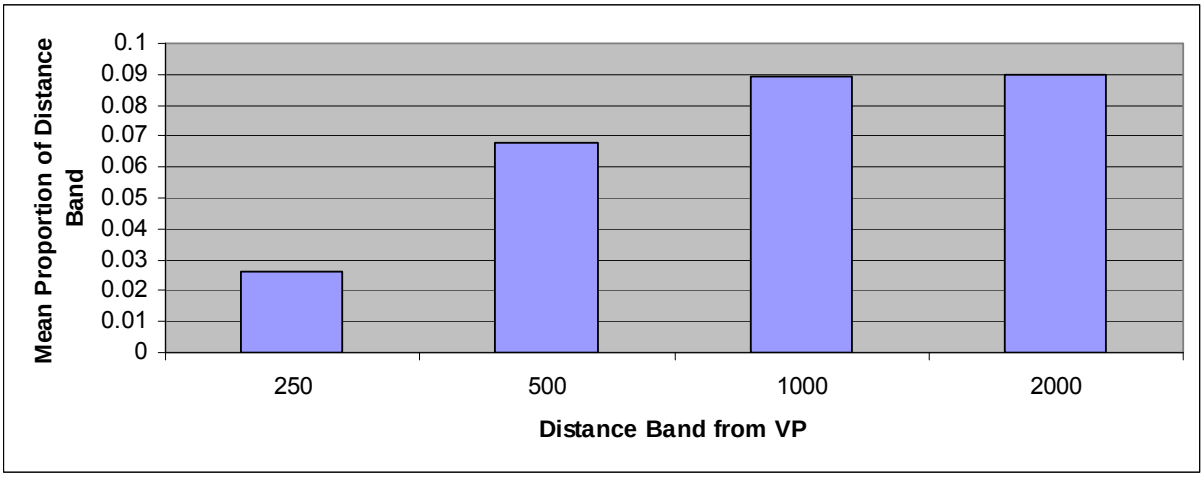
In response to SNH's subsidiary points on the 800m buffer, the Applicant has not placed an over-reliance on the outcome of monitoring from any sites. There is already overwhelming evidence presented in the Addendum to confidently conclude, beyond reasonable scientific doubt, there will be no adverse effect on the integrity of the SPA arising from potential greenshank collisions. This latter conclusion remains the same, in light of the additional clarification on territory distribution requested by SNH. SNH has already confirmed it has no concerns over the predicted impacts of Strathy South on golden plover, so reference to findings on this species at Gordonbush are not of particular relevance. Furthermore, if SNH's reasoning on long-term datasets is applied to the Gordonbush golden plover data (which is relatively short-term), then the information on windfarm effects on this species at that site are inconclusive in any case.

On the issue of the distance detection work, SNH continues to express doubts over the extent to which the Strathy South distance detection correction accounts for reduced detectability (and hence underestimated collision estimates) of greenshank during vantage point (VP) surveys. There appears to be some confusion over how the distance correction has been calculated because it is stated in SNH's letter of 23rd May 2014 that the correction depends upon the form of the assumed distance detection function. However, it is important to note that the actual correction is based upon the differences in flight activity density between the different distance bands as calculated using the actual raw data (as opposed to using predicted values from a regression model). Consequently, no assumptions are made over the form of the detection function (i.e. an underlying equation). In the work undertaken to produce the distance detection correction, the general linear mixed model (GLMM) was used solely for the purposes of testing whether flight activity density differed between distance bands, whilst simultaneously accounting for the effects of year (and also the interaction between year and vantage point effects and for the potential pseudo-replication resulting from multiple surveys being derived from individual VPs). There would be considerable difficulties in producing 'distance detection' predictions from this model because of the inclusion of the random effect of VP, which complicates the derivation of predicted values. The purpose of the GLMM and the process by which distance detection corrections are calculated were explained in the original documentation on the distance detection work (i.e. Strathy South Addendum Technical Appendix 11.3).

In considering the Strathy South distance detection work, SNH has proposed that the low level of flight activity recorded in the closest distance band (0 – 250m) is likely to be due to observer disturbance. As previously highlighted, if such an effect did occur (despite surveyors allowing for a settling period), this would entirely undermine all vantage point survey data in open habitats, and represent a significant generic flaw in the resulting data being used for collision risk modelling. The alternative and far more obvious explanation is that VPs are located on elevated sites so that the closest distance band will tend to be on higher (and hence generally drier) ground, which is less suitable for greenshank. Data have now been extracted on the altitudes within the different VP distance bands and these show the following:

Distance band	Mean altitude (± 1s.e.)
0-250	167.4m (± 5.4)
250-500	161.3m (± 4.9)
500-1000	157.5m (± 5.2)
1000-2000	160.0m (± 4.1)

As can be seen, these data confirm that there are differences in altitude between the different distance bands. The mean altitudes in the closest distance band are higher than those in the second distance band at 10 of 12 VPs that contributed to the distance detection work, with the difference in altitude between these two distance bands being statistically significant on a paired t-test (P = 0.003). Although, the magnitude of the difference in altitude is relatively small, within the context of the topography of the Strathy South survey site, these data show that the closest distance band occurs on relatively high ground, which is likely to coincide with the drier habitats that will be less used by breeding greenshank. As further confirmation of the lack of suitable greenshank habitat within the closest distance band, data extracted on the extent (area) of pool systems and lochans (wetland habitat that greenshank select) across these same distance bands, shows that such wetland habitat is scarce within the closest distance band (see bar chart below). Thus, these data on the extent of wetland habitat and altitude indicate strongly that the low flight activity in the closest distance band is not unexpected and is due to the scarcity of suitable greenshank habitat.



In summary in relation to collision risk, firstly it is clear that the distance detection correction used on the Strathy South greenshank flight data goes beyond the level of precaution that is typically applied in determining collision risk for small to medium sized breeding wader species in assessments of windfarm impacts. Despite this high level of precaution being applied, collision estimates remain acceptably low. Furthermore, this remains the case even when unlikely assumptions are made concerning high levels of underestimation by the distance detection correction (i.e. by doubling, quadrupling etc the correction factor). Thus, taking the 'multiplier' approach that SNH has accepted elsewhere (on peregrine, for example, in the case of windfarm development adjacent to the Muirkirk and North Lowther Uplands SPA) even if the adjusted predicted collision rate is increased eight-fold (to cover any conceivable uncertainty), the predicted number of collisions is still under 0.5, or 1 bird every 2 years. Taking it to further extremes and multiplying collisions by a factor of 16 gives just 1 collision per year. In adjusting for detectability as far as is possible (and going way beyond SNH Guidance) and then increasing mortality 16 fold, it is clearly taking precaution to extreme levels. Even

with such hugely precautionary assumptions applied, just 1 bird a year is potentially predicted to collide.

The Caithness and Sutherland SPA population of greenshank is estimated to be 653 breeding pairs, giving 1306 breeding adult birds (Bellamy & Eaton 2010). The 95% statistical confidence intervals about this estimate give a range of 389 to 917 breeding pairs (or 778 to 1834 breeding adult birds). Thus, even under extreme precautionary assumptions, the losses per year from collisions would represent just 0.08% of the breeding adult population (i.e. 1 bird from a population size of 1306). Adding further precaution and assuming that the real population size is equivalent to the lower 95% confidence limit, then these losses would represent 0.13% of the breeding population (i.e. 1 bird from a population size of 778). To understand the potential impact of the additional mortality from collisions on the population viability, it is useful to also consider the collision mortality in terms of the increase it represents to the baseline annual mortality rate for the population. Estimates of the annual mortality rate of greenshank do not appear to be available but annual mortality in the closely related redshank is estimated at 26% (http://www.bto.org/about-birds/birdfacts). If it assumed (again on a precautionary basis) that annual mortality in greenshank is considerably lower than this at 20%, then the effect of increasing the annual mortality in a population of 1306 birds by 1 bird, represents an increase of 0.38% to the annual mortality rate. To add further precaution and calculate this for a population size of 778 birds (i.e. equivalent to the lower 95% confidence interval for the estimated population size), produces an increase of 0.64% in the baseline annual mortality rate. Despite the extreme and excessively precautionary assumptions upon which this level of additional mortality is based, these increases to the annual mortality rate are small and would not affect population viability.

What is also perplexing and inexplicable about SNH's position, is that for other SPA casework there are several examples where SNH ornithology advisors have accepted the approach of multiplying the calculated predicted mortality by 2, 5 or 10, to account for worst case scenarios, and used this as the basis upon which to make a suitably well informed consultation response. This has been the case for species whose SPA qualifying population was small.

This is even without taking into account mitigating factors that (i) that forest clearance in itself, without any active predator control has the potential to benefit greenshank breeding success, by reducing the abundance of pine marten, fox and avian predators within foraging range of greenshank nests and young, and (ii) if SNH is still concerned about such a hypothetically extreme worst case loss of greenshank, control of foxes is a potentially effective mitigation option for ground nesting birds (and will benefit greenshank, given a range of field signs indicate that foxes can cause mortality and nest failure in greenshank (Nethersole-Thompson 1979).

As with red-throated diver, therefore, we firmly consider that Scottish Ministers can conclude beyond reasonable scientific doubt, that there will be no adverse affect on the integrity of the SPA.

Conclusion

As previously noted, gradual progress has been made and the Applicant welcomes the fact that over the last 10 months, SNH has dropped all habitat, protected species, and earlier objections on raptors, black-throated diver and other waders, subject to appropriate conditions being put in place.

The Applicant is however concerned that recent SNH correspondence, notably its letter dated 23rd May 2014, reveals an inappropriate focus on inconsequential or irrelevant methodological and technical issues, which has resulted in slow progress in resolving or concluding on the remaining two

issues, specifically red-throated delivers and greenshank. The points raised by SNH are in many instances contradictory, unjustified, incorrect or unwarranted. It is also not clear whether SNH has properly considered the information held by SNH that is pertinent to concerns over greenshank for example, specifically the 2013 monitoring report from Rosehall windfarm, which includes more up-to-date results of greenshank breeding from monitoring at this operational site.

The Applicant considers that the quantity and quality of information that is currently available allows the conclusion to be safely reached, beyond reasonable scientific doubt, that there would be no adverse effect on the integrity of the SPA from Strathy South, alone or in combination with other plans or projects. For the reasons set out above, SNH is requested to re-consider the available evidence, and to engage further with the Applicant and RPS as this would assist in its consideration and resolution of the issues. As matters stand, the advice currently provided by SNH to Ministers on greenshank and red-throated divers at the Strathy South project is considered by the Applicant to be neither correct nor reliable.

SSE Renewables

RPS

Key

- Site Boundary

Strathy South EUK VPs
- 1
- 2
- 3
- 4

Strathy South RPS VPs
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20
- 21
- 24
- 25
- 26

Strathy North VPs
- 1
- 3
- 4
- 6
- 7
- 8
- 16
- 17

Strathy Wood VPs
- 1
- 2
- 3
- 4
- 5

- Loch 64

All viewsheds are calculated to 20 m.

Scale 1:50,000 @ A3

0 0.5 1 2 km

N

Figure 1.2
Normal and diver viewsheds used at or near Strathy South since 2003

Strathy South Wind Farm Clarification

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Kate Lyon

Subject: FW: Strathy South Wind Farm

From: Dave Mackay [mailto:Dave.Mackay@snh.gov.uk]
Sent: 21 August 2014 14:52
To: George Baxter
Cc: 'Simon Zisman'; Nicki Small; Andrew Bachell
Subject: RE: Strathy South Wind Farm

Dear George,

Thanks for your email. Andrew has asked me to reply.

Since we were consulted by Energy Consents and Deployment Unit (ECDU) on the Addendum to the Strathy South S.36 application in August 2013, I think you would agree that good progress has been made resolving most of the issues of concern raised by SNH. Between August 2013 and April 2014, through discussion and correspondence with SSE and RPS, we were able to resolve the following issues:

- Caithness and Sutherland Peatlands Special Area of Conservation – impacts blanket bog and wet heath habitats, peat landslide and hazard risk assessment, and otter.
- Caithness and Sutherland Peatlands Special Protection Area (SPA) – impacts to hen harrier, black-throated diver, wood sandpiper and golden eagle.

Similarly, through discussion and correspondence we have tried to resolve the two remaining points of objection that is, greenshank and red-throated diver, connected to the above mentioned SPA. However, we have not been able to reach agreement over the degree of impacts or the level of uncertainty connected with those impacts. I accept that key parties should try and make reasonable efforts to agree areas of common ground, but I think discussions over greenshank and red-throated diver have reached a stalemate.

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Kind regards,

David Mackay
Operations Manager
Northern Isles and North Highland

Scottish Natural Heritage
The Links
Golspie Business Park
Golspie
KW10 6UB

Tel: 01738 771 100
Fax: 01408 634 014
dave.mackay@snh.gov.uk

From: George Baxter [mailto:george.baxter@sse.com]
Sent: 19 August 2014 12:21
To: Andrew Bachell
Cc: Simon Zisman; Dave Mackay; Nicki Small
Subject: Strathy South Wind Farm

Dear Andrew

I am writing following our letter of 6th June 2014 to the Energy Consents and Deployment Unit (attached). We have, to date, received no response to this correspondence from SNH (although it was copied to yourself and Dave Mackay and related to points previously raised by SNH).

To move matters forward we are conscious that ahead of the pre-inquiry meeting for the Strathy South public inquiry it will be expected that key parties to have made every reasonable effort to agree areas of common ground, so that the inquiry can focus on remaining areas of contention.

We therefore request a meeting with SNH, to obtain your clarification and agreement on the following matters in relation to greenshank:

1. The method to determine greenshank territory centres
2. Greenshank habitat relationships

If you could please let me know the soonest opportunity that it would be possible to meet, that would be appreciated.

Kind Regards

George

George Baxter
SSE Renewables

T: 07825 015184 www.sse.com

Kate Lyon

From: Nicki Small <nicki.small@sserenewables.com>
Sent: 29 August 2014 14:01
To: Kate Lyon; Nathan Swankie
Cc: 'Steven (UK) Black'
Subject: FW: Strathy South Wind Farm

Follow Up Flag: Follow up
Flag Status: Flagged

FYI

From: Dave Mackay [mailto:Dave.Mackay@snh.gov.uk]
Sent: 29 August 2014 14:01
To: George Baxter
Cc: Andrew Bachell; Nicki Small; 'Simon Zisman'; 'Nikki.Anderson@'
Subject: RE: Strathy South Wind Farm

Dear George,

Thanks for your email. I'd like to discuss with colleagues before replying, but we would aim to reply by the end of next week (5 September).

Kind regards,

David Mackay
Operations Manager
Northern Isles and North Highland

Scottish Natural Heritage
The Links
Golspie Business Park
Golspie
KW10 6UB

Tel: 01738 771 100
Fax: 01408 634 014
dave.mackay@snh.gov.uk

From: George Baxter [mailto:george.baxter@sse.com]
Sent: 26 August 2014 17:04
To: Dave Mackay
Cc: Andrew Bachell; 'Nicki Small'; 'Simon Zisman'; Nikki.Anderson@
Subject: RE: Strathy South Wind Farm

Dear David

Many thanks for your reply.

I agree that there has been some notable progress made, albeit with some perseverance on the part of SSE, primarily as a result of the two ornithology meetings that have taken place between us to date.

I am therefore surprised and disappointed by your use of the term 'stalemate'. I had hoped we were engaged in a

process of dialogue and that SNH has stated aims to support constructive engagement not only at this site but generally to resolve concerns over renewable energy development, particularly to assist in the delivery of government policy on low carbon economic development and to tackle climate change.

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Sincerely

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George Baxter
SSE Renewables

T: 07825 015184 www.sse.com

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To: 'George Baxter' <george.baxter@sse.com>
Cc: 'Simon Zisman' <ZismanS@rpsgroup.com>, 'Nicki Small' <nicki.small@sserenewables.com>, Andrew Bachell <Andrew.Bachell@snh.gov.uk>
Date: 21/08/2014 14:52
Subject: RE: Strathy South Wind Farm

Dear George,

Thanks for your email. Andrew has asked me to reply.

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Kind regards,

David Mackay
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Northern Isles and North Highland

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Tel: 01738 771 100
Fax: 01408 634 014
dave.mackay@snh.gov.uk

From: George Baxter [mailto:george.baxter@sse.com]
Sent: 19 August 2014 12:21
To: Andrew Bachell
Cc: Simon Zisman; Dave Mackay; Nicki Small
Subject: Strathy South Wind Farm

Dear Andrew

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Kind Regards

George

George Baxter
SSE Renewables

T: 07825 015184 www.sse.com

The information in this email is confidential and may be legally privileged. It may not represent the views of the SSE Group. It is intended solely for the addressees. Access to this email by anyone else is unauthorised. If you are not the intended recipient, any disclosure, copying, distribution or any action taken

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

Nikki Anderson
By email (Nikki.anderson@scotland.gsi.gov.uk)

11th September 2014

Dear Nikki

Strathy South Wind Farm

Thank you for your email of the 2nd of September regarding the forthcoming Inquiry. We have had separate correspondence on this matter from George Baxter by email on 26 August.

We agree that it would be useful to resolve issues surrounding impact on birds before the inquiry. To do this we are more than happy to meet SSE and yourselves, but it must be to consider new information. We have already considered at length the data submitted previously by SSE and have made it clear that there will be little point in further review unless SSE can provide further information or fresh interpretation. Looking at the existing data will not resolve the outstanding issues.

We understand the importance of this development and of this site to the various interested parties which is why there has been significant exchange between SSE and SNH. Feedback received from SSE and RPS staff following the previous meeting was very positive and the detailed clarification provided by our ornithological specialists was also warmly welcomed. We are therefore somewhat surprised by several aspects of the recent correspondence from SSE. There remains disagreement between SSE and SNH about the degree of impacts and level of uncertainty connected with those impacts for red-throated diver and greenshank. As both of these species are protected interests of a Special Protection Area, there needs to be a high degree of confidence to satisfy the requirements of the relevant EU Directives. Based on the information we have seen to date and having reviewed George's letter of 6 June to ECDU, we remain on the view that those requirements cannot be met.

George refers to the fact that SNH did not reply to that letter. The reason for that is that the points made were not addressed to SNH but to ECDU. Had ECDU requested information to help them reply we would obviously have done so.

Yours sincerely

Andrew Bachell
Director of Operations

Scottish Natural Heritage, Great Glen House, Leachkin Road, Inverness, IV3 8NW
Tel: 01463 725000 Fax: 01463 725067
www.snh.gov.uk

Dualchas Nàdair na h-Alba, Taigh a' Ghlinne Mhòir, Rathad na Leacainn, Inbhir Nis, IV3 8NW
Fòn: 01463 725000 Facs: 01463 725067
www.snh.gov.uk/gaelic

Kate Lyon

Subject: FW: Strathy South Wind Farm

From: Andrew Bachell [mailto:Andrew.Bachell@snh.gov.uk]
Sent: 11 September 2014 13:44
To: Baxter, George
Subject: Strathy South Wind Farm

Dear George

Thank you for your recent email. You will have seen my letter to Nikki Anderson of earlier today. We are always happy to meet with you to seek resolution of the remaining issues. However, there is little point in meeting if there is no further information or fresh interpretation to discuss. I thought this was the commonly agreed understanding following the two ornithological meetings.

We have not responded to your letter of 6 June, as it was addressed to ECDU and not ourselves.

Yours sincerely

Andrew Bachell
Director of Operations
Scottish Natural heritage

From: George Baxter [mailto:george.baxter@sse.com]
Sent: 09 September 2014 16:58
To: Dave Mackay
Cc: Andrew Bachell; 'Nicki Small'; 'Nikki.Anderson@'; 'Simon Zisman'
Subject: RE: Strathy South Wind Farm

Dear David

Wondering how you getting on with making arrangements for a meeting? Diaries are clearly always an issue so the earlier we can look at options the better, although be assured that SSE is prepared to be fully flexible on timing and location to work around you.

Regards

George

George Baxter
SSE Renewables

T: 07825 015184 www.sse.com

From: Dave Mackay <Dave.Mackay@snh.gov.uk>
To: 'George Baxter' <george.baxter@sse.com>
Cc: Andrew Bachell <Andrew.Bachell@snh.gov.uk>, 'Nicki Small' <nicki.small@sserenewables.com>, 'Simon Zisman' <ZismanS@rpsgroup.com>, '"Nikki.Anderson@"' <scotland.gsi.gov.uk Nikki.Anderson@scotland.gsi.gov.uk>
Date: 05/09/2014 16:54
Subject: RE: Strathy South Wind Farm

Dear George,

Sorry but I won't be able to reply to your email of 26 August as planned by close of play today, but will reply early next week.

Regards,

David Mackay
Operations Manager
Northern Isles and North Highland

Scottish Natural Heritage
The Links
Golspie Business Park
Golspie
KW10 6UB

Tel: 01738 771 100
Fax: 01408 634 014
dave.mackay@snh.gov.uk

From: George Baxter [mailto:george.baxter@sse.com]
Sent: 26 August 2014 17:04
To: Dave Mackay
Cc: Andrew Bachell; 'Nicki Small'; 'Simon Zisman'; Nikki.Anderson@
Subject: RE: Strathy South Wind Farm

Dear David

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I am therefore surprised and disappointed by your use of the term 'stalemate'. I had hoped we were engaged in a process of dialogue and that SNH has stated aims to support constructive engagement not only at this site but generally to resolve concerns over renewable energy development, particularly to assist in the delivery of government policy on low carbon economic development and to tackle climate change.

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Cc: 'Simon Zisman' <ZismanS@rpsgroup.com>, 'Nicki Small' <nicki.small@sserenewables.com>, Andrew Bachell <Andrew.Bachell@snh.gov.uk>
Date: 21/08/2014 14:52
Subject: RE: Strathy South Wind Farm

Dear George,

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Kind regards,

David Mackay
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Northern Isles and North Highland

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dave.mackay@snh.gov.uk

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Sent: 19 August 2014 12:21
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active and natural resources as well as our creativity, culture and ancestral heritage.

homecomingscotland.com

Kate Lyon

Subject: FW: Strathy South Wind Farm

From: George Baxter [mailto:george.baxter@sse.com]
Sent: 01 September 2014 09:11
To: Dave Mackay
Cc: Andrew Bachell; Nicki Small; 'Simon Zisman'; Nikki.Anderson@
Subject: RE: Strathy South Wind Farm

Dear David

If we can get a date in the diary in advance of any pre-inquiry meeting, which I understand could be quite soon, that would be most appreciated.

Thanks

George

George Baxter
SSE Renewables

T: 07825 015184 www.sse.com

From: Dave Mackay <Dave.Mackay@snh.gov.uk>
To: 'George Baxter' <george.baxter@sse.com>
Cc: Andrew Bachell <Andrew.Bachell@snh.gov.uk>, 'Nicki Small' <nicki.small@sserenewables.com>, 'Simon Zisman' <ZismanS@rpsgroup.com>, '"Nikki.Anderson@"' <scotland.gsi.gov.uk Nikki.Anderson@scotland.gsi.gov.uk>
Date: 29/08/2014 14:00
Subject: RE: Strathy South Wind Farm

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Kind regards,

David Mackay
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homecomingscotland.com

Kate Lyon

Subject: FW: Strathy South Wind Farm

From: Baxter, George [mailto:george.baxter@sse.com]
Sent: 11 September 2014 18:06
To: Andrew Bachell
Cc: david.mackay@snh.gov.uk; nikki.anderson@scotland.gsi.gov.uk; 'ZismanS@rpsgroup.com'; Nicki Small
Subject: RE: Strathy South Wind Farm

Dear Andrew

I write further to your email today, and in relation to your letter to Nikki Anderson at ECDU - please confirm whether this is your response to my email to Dave Mackay of 26th August?

In any event, from my reading of your letter there appears to be some misunderstanding. To clarify our position, we are very keen, and think it would be most beneficial, for a meeting to take place between SNH and SSE. We are **not** currently suggesting a meeting with ECDU at this point.

The main purpose of the meeting between SNH and SSE, as we suggested previously, is to obtain clarification from SNH on its approach to determining flight activity in relation to Greenshank territory centres, and Greenshank habitat relationships. We feel these are complex discussions that are best explored through constructive discussion, at a round table meeting.

SSE is awaiting information from SNH, namely points of clarification in order to be able to comprehend the position SNH is taking on the above. Clarification on these points will allow SSE to consider whether there can be any clearer or "fresh" interpretation on the Greenshank questions, which seems to be what SNH is willing to discuss. It would therefore be helpful to get a meeting arranged to discuss these points so that we can make constructive progress without any further delay.

In relation to the outcome of the last ornithology meeting, indeed, it was very positive to have been able to have that meeting. The discussion around some of the issues was also positive to a degree albeit limited by time available from your team. However, we remain very unclear on the justification for SNH's positions, particularly in relation to Greenshank, hence these repeated requests for some diary date options for a meeting ahead of any pre-inquiry process.

In relation to your references in your letter of today to Nikki Anderson, regarding the SSE letter of 6 June, thanks very much for reviewing that; albeit that it was addressed to the ECDU, most of it was in relation to the position of SNH. Can I ask you to set out your considerations in writing so that we can review them? That information would also be useful to inform a meeting where we can hopefully constructively address the issues and reach a better understanding of the mutual positions, if not resolution. Please note however, that we would wish to progress a meeting on the outstanding SNH clarification to the specific technical Greenshank matters referred to above in any case – we request that this meeting should not to be delayed by any further review and response to of all of the points set out in the 6 June letter.

I hope this clarifies matters and that you will consider our respectful request for a meeting with some urgency. Given that these are quite technical matters, a minimum requirement would be your ornithologist, either David Woods or Andy Douse, or both to be in attendance. If you are able to set out some date options that would be very much appreciated.

Best wishes

George

From: Andrew Bachell [mailto:Andrew.Bachell@snh.gov.uk]
Sent: 11 September 2014 13:44
To: Baxter, George
Subject: Strathy South Wind Farm

Dear George

Thank you for your recent email. You will have seen my letter to Nikki Anderson of earlier today. We are always happy to meet with you to seek resolution of the remaining issues. However, there is little point in meeting if there is no further information or fresh interpretation to discuss. I thought this was the commonly agreed understanding following the two ornithological meetings.

We have not responded to your letter of 6 June, as it was addressed to ECDU and not ourselves.

Yours sincerely

Andrew Bachell
Director of Operations
Scottish Natural heritage

From: George Baxter [mailto:george.baxter@sse.com]
Sent: 09 September 2014 16:58
To: Dave Mackay
Cc: Andrew Bachell; 'Nicki Small'; 'Nikki.Anderson@'; 'Simon Zisman'
Subject: RE: Strathy South Wind Farm

Dear David

Wondering how you getting on with making arrangements for a meeting? Diaries are clearly always an issue so the earlier we can look at options the better, although be assured that SSE is prepared to be fully flexible on timing and location to work around you.

Regards

George

George Baxter
SSE Renewables

T: 07825 015184 www.sse.com

From: Dave Mackay <Dave.Mackay@snh.gov.uk>
To: 'George Baxter' <george.baxter@sse.com>
Cc: Andrew Bachell <Andrew.Bachell@snh.gov.uk>, 'Nicki Small' <nicki.small@sserenewables.com>, 'Simon Zisman' <ZismanS@rpsgroup.com>, '"Nikki.Anderson@" <scotland.gsi.gov.uk Nikki.Anderson@scotland.gsi.gov.uk>
Date: 05/09/2014 16:54
Subject: RE: Strathy South Wind Farm

Dear George,

Sorry but I won't be able to reply to your email of 26 August as planned by close of play today, but will reply early next week.

Regards,

David Mackay
Operations Manager
Northern Isles and North Highland

Scottish Natural Heritage
The Links
Golspie Business Park
Golspie
KW10 6UB

Tel: 01738 771 100
Fax: 01408 634 014
dave.mackay@snh.gov.uk

From: George Baxter [mailto:george.baxter@sse.com]
Sent: 26 August 2014 17:04
To: Dave Mackay
Cc: Andrew Bachell; 'Nicki Small'; 'Simon Zisman'; Nikki.Anderson@
Subject: RE: Strathy South Wind Farm

Dear David

Many thanks for your reply.

I agree that there has been some notable progress made, albeit with some perseverance on the part of SSE, primarily as a result of the two ornithology meetings that have taken place between us to date.

I am therefore surprised and disappointed by your use of the term 'stalemate'. I had hoped we were engaged in a process of dialogue and that SNH has stated aims to support constructive engagement not only at this site but generally to resolve concerns over renewable energy development, particularly to assist in the delivery of government policy on low carbon economic development and to tackle climate change.

Both prior to, and since, submission of the Strathy South Addendum, SSE has offered numerous options to facilitate dialogue and meetings between our ornithologists and SNH, either attending SNH offices in Inverness, Golspie or Shetland. Over this period, in spite of all of our attempts, our requests have been declined, with the exception, after long periods and delayed responses, of the two aforementioned ornithology meetings. Although useful, we felt the meetings did not adequately entail constructive dialogue on the two remaining issues, namely concerns in relation to Red Throated Diver and Greenshank.

Incidentally, we were further disappointed, given this situation and the continual attempts for clear constructive dialogue, that SNH staff carried out a site visit to Strathy South, of which we were not informed, which would have been an ideal opportunity to discuss these two remaining concerns first hand, and how outstanding matters could have been potentially minimised or resolved.

Given the above, your latest response is therefore again disappointing. SSE considers it entirely premature to conclude there is a 'stalemate' over red-throated divers or greenshank in particular. SSE's view is that SNH has also not yet fully addressed the key points made in SSE's letter to SNH dated 6th June 2014 and given the technical and

statistical nature of SNH's position on greenshank, our ornithological advisors, RPS, consider it important to obtain detailed clarification from SNH on its approach to determining flight activity in relation to Greenshank territory centres, and Greenshank habitat relationships. We feel these are complex discussions that are best explored through constructive discussion, at a round the table meeting.

In relation to your interpretation of the position of ECDU, for the avoidance of doubt, what was accepted by us was a recognition that given the process of public inquiry initiated by Highland Council, a meeting 'convened' by ECDU may not be appropriate, but meetings between SNH and SSE to further discuss the areas of concern and seek better understanding between us, or to possibly resolve them in advance of a pre-inquiry meeting, would remain a most useful thing to do. I am copying in the ECDU to this correspondence in this regard so that there is no doubt over SSE's desire to continue dialogue and constructive engagement with SNH.

Given there are still issues which require specific and detailed clarification from SNH, I would urge SNH to reconsider the opportunity to meet and look forward to engaging with you and your relevant staff constructively at your earliest convenience.

Sincerely

George

George Baxter
SSE Renewables

T: 07825 015184 www.sse.com

From: Dave Mackay <Dave.Mackay@snh.gov.uk>
To: 'George Baxter' <george.baxter@sse.com>
Cc: 'Simon Zisman' <ZismanS@rpsgroup.com>, 'Nicki Small' <nicki.small@sserenewables.com>, Andrew Bachell <Andrew.Bachell@snh.gov.uk>
Date: 21/08/2014 14:52
Subject: RE: Strathy South Wind Farm

Dear George,

Thanks for your email. Andrew has asked me to reply.

Since we were consulted by Energy Consents and Deployment Unit (ECDU) on the Addendum to the Strathy South S.36 application in August 2013, I think you would agree that good progress has been made resolving most of the issues of concern raised by SNH. Between August 2013 and April 2014, through discussion and correspondence with SSE and RPS, we were able to resolve the following issues:

- Caithness and Sutherland Peatlands Special Area of Conservation – impacts blanket bog and wet heath habitats, peat

landslide and hazard risk assessment, and otter.

- Caithness and Sutherland Peatlands Special Protection Area (SPA) – impacts to hen harrier, black-throated diver, wood sandpiper and golden eagle.

Similarly, through discussion and correspondence we have tried to resolve the two remaining points of objection that is, greenshank and red-throated diver, connected to the above mentioned SPA. However, we have not been able to reach agreement over the degree of impacts or the level of uncertainty connected with those impacts. I accept that key parties should try and make reasonable efforts to agree areas of common ground, but I think discussions over greenshank and red-throated diver have reached a stalemate.

I note that ECDU had initially requested a meeting of the relevant parties, following your letter of 6 June 2014 to ECDU. However, following the subsequent advice by Highland Council to EDCU, this resulted in the decision by EDCU and supported by you, that such a meeting was no longer required and parties were instead preparing for an Inquiry. The two issues you raise in your email of 19 August are issues, as I understand it, which have been discussed and outlined in previous correspondence. I would therefore question the value of a meeting, unless new information could be presented.

Kind regards,

David Mackay
Operations Manager
Northern Isles and North Highland

Scottish Natural Heritage
The Links
Golspie Business Park
Golspie
KW10 6UB

Tel: 01738 771 100
Fax: 01408 634 014
dave.mackay@snh.gov.uk

From: George Baxter [mailto:george.baxter@sse.com]
Sent: 19 August 2014 12:21
To: Andrew Bachell
Cc: Simon Zisman; Dave Mackay; Nicki Small
Subject: Strathy South Wind Farm

Dear Andrew

I am writing following our letter of 6th June 2014 to the Energy Consents and Deployment Unit (attached). We have, to date, received no response to this correspondence from SNH (although it was copied to yourself and Dave Mackay and related to points previously raised by SNH).

To move matters forward we are conscious that ahead of the pre-inquiry meeting for the Strathy South public inquiry it will be expected that key parties to have made every reasonable effort to agree areas of common ground, so that the inquiry can focus on remaining areas of contention.

We therefore request a meeting with SNH, to obtain your clarification and agreement on the following matters in relation to greenshank:

1. The method to determine greenshank territory centres
2. Greenshank habitat relationships

If you could please let me know the soonest opportunity that it would be possible to meet, that would be appreciated.

Kind Regards

George

George Baxter
SSE Renewables

T: 07825 015184 www.sse.com

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