

## Proposed Wind Energy Project and Associated Ancillary Development at Ascog Farm, Bute

### Appendices

Prepared for: Argyll and Bute Council

On behalf of: Mr A Tear & Ms E McVey

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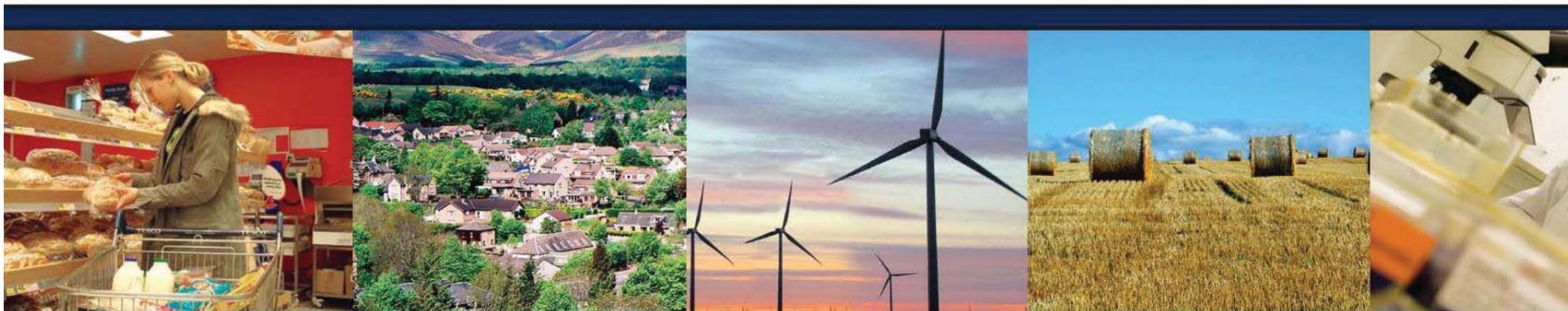
Date: 28 September 2012



Certificate FS 94274  
ISO 9001:2008



Certificate EMS 561094  
ISO 14001:2004

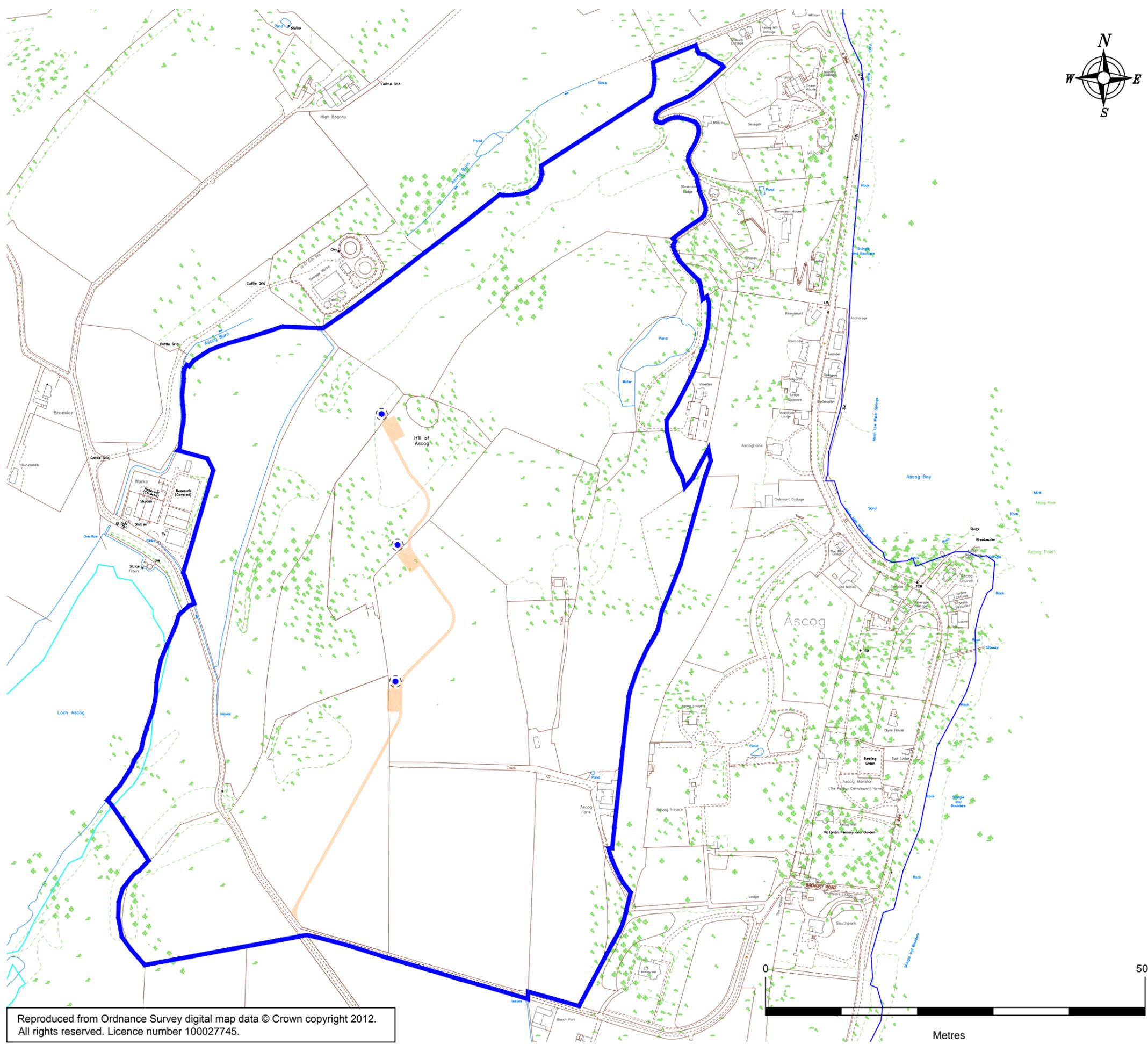


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## **APPENDIX A: SITE DRAWINGS**



1 THIS DRAWING MUST NOT BE SCALED  
 2 THE CONTRACTOR IS TO CHECK ALL DIMENSIONS ON SITE

**Legend**

- Landowner Boundary
- Turbines
- Access Track and Crane Hardstandings

Rev	Revision Description	By	Date

Contract  
**Ascog Wind Energy Project**

For  
**Mr A Tear & Ms E McVey**

Drawing Title  
**Site Plan**

Drawing No. <b>Figure 1.2</b>	Revision <b>28/09/2012</b>	Scale <b>1:5000 @ A3</b>
Drawn <b>GM</b>	Date <b>18/03/2012</b>	Reviewed By <b>JC</b>
File No. <b>2060379</b>		

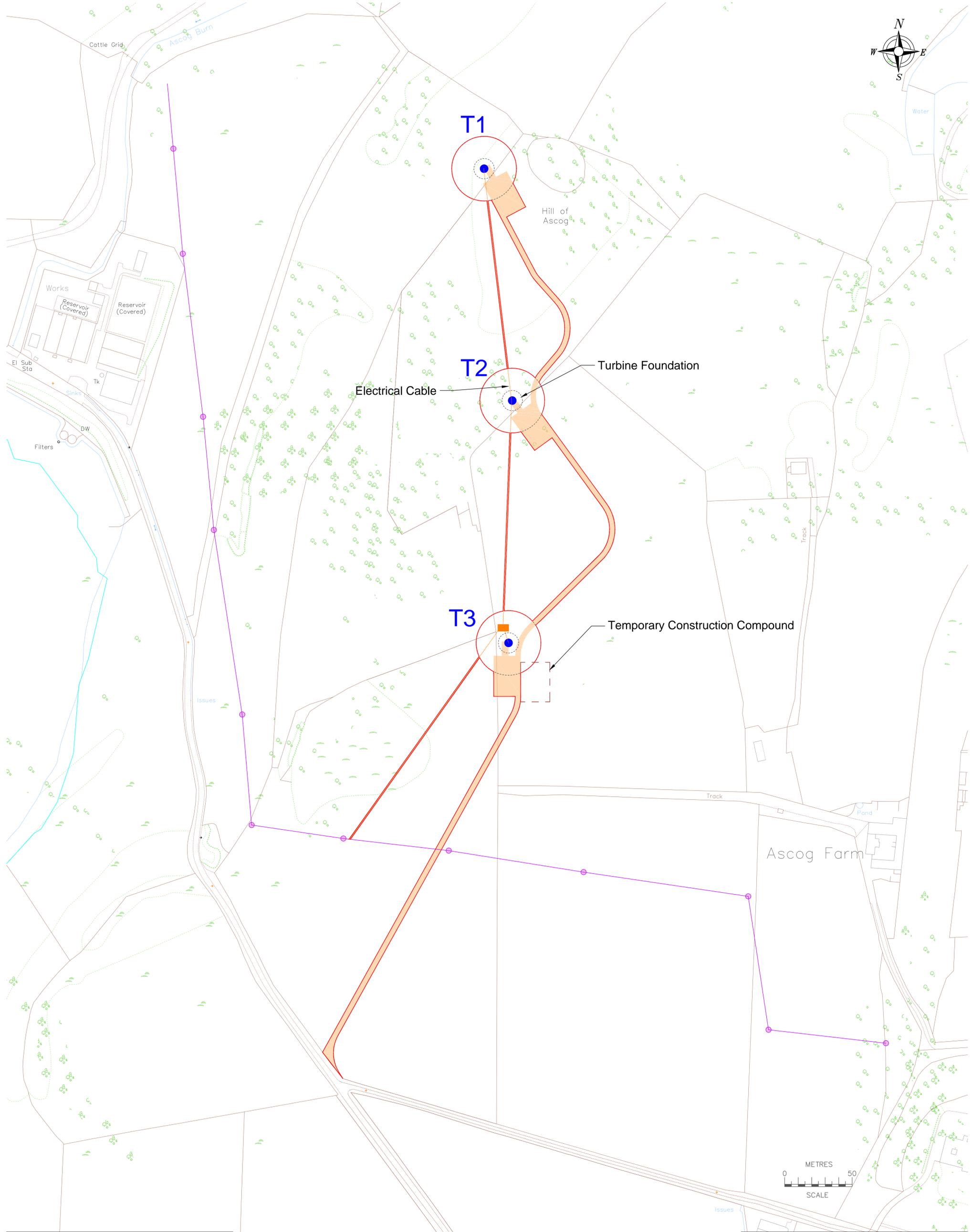
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**SITE DEVELOPMENT AREA = 0.93 ha**

Legend	
	Site Development Boundary
	Access Track and Crane Hardstandings
	Site Control Building
	Existing Overhead HV Cable
	Proposed Turbines

Contract <b>Ascog Wind Energy Project</b>		
Drawing No. <b>Figure 1.3</b>		

Drawing Title <b>Detailed Site Plan</b>		
For <b>Mr A Tear &amp; Ms E McVey</b>		
Drawn <b>GM</b>	Date <b>18/03/2012</b>	File No. <b>2060379</b>
Revision <b>26/10/2012</b>	Scale <b>1:1250 @ A1</b>	Reviewed By <b>JC</b>

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## APPENDIX B: EIA

### Summary of Correspondence with Consultees

Consultee	Date of Response	Response	Comment
Argyll and Bute Council	21 January 2011	Received scoping response to inform the content of the ES.	
SNH	15 December 2010  10 August 2011	Requested following key issues must be identified and address in detail as part of the EIA process: <ul style="list-style-type: none"> <li>• Ecological impacts</li> <li>• Landscape and visual impacts</li> <li>• Recreational impacts</li> <li>• Site decommissioning and restoration proposals</li> </ul> Further consulted on ZTV and VP list. Provided information to be covered in the ES.	Scope of ecology work provided for consultation on 15 April 2011. SNH responded on 19 April 2011: considered the extent of survey work proposed is appropriate to the scale of the development and the ecological sensitivity of the site. Noted that SNH will be consulted again following the two further VP goose studies.  Consulted SNH regarding goose studies on 3 May 2011. SNH responded on 11 May 2011 confirming that the proposed approach is satisfactory.
SEPA	8 December 2010	Requested following key issues should be addressed in the EIA process: <ul style="list-style-type: none"> <li>• Peat management</li> <li>• Environmental management and</li> </ul>	

Consultee	Date of Response	Response	Comment
		<p>pollution prevention</p> <ul style="list-style-type: none"> <li>• Engineering activities in the water environment</li> <li>• Water abstraction</li> <li>• Borrow pits</li> <li>• Air quality</li> <li>• Flood risk</li> <li>• Groundwater</li> </ul>	
Historic Scotland	14 December 2010	Concerns about potential adverse impact on the Category A listed Balmory House.	Turbine 4 was deemed to have an adverse impact on Balmory House and was therefore removed from the layout.
Scottish Water	20 December 2010	Assets are not affected.	
Transport Scotland	1 December 2010	Proposed development likely to cause minimal environmental impact on truck road network.	
Inverclyde Council	25 November 2010	Impact of development would be minimal.	
West of Scotland Archaeology Service	31 January 2011	Two sites recorded from within the boundaries of the application area: the former settlement of Teyvealley or Tayvalley (located close to the proposed location of turbine 4) and an enclosure (located close to the proposed location of turbine 1). Requested these be covered in ES.	
Ofcom	14 July 2010	Two fixed links within 350 m of the turbines – BT (link 0480952/1) and Orange (link 0780919/1).	Consulted BT and Orange.

Consultee	Date of Response	Response	Comment
JRC	2 March 2011	No concerns.	
Atkins Global	5 July 2010	No objection.	
BT	14 July 2010	Impact on link ID6080.	Through a revision of the site layout, BT removed their concerns to the proposed development.
Orange	3 August 2010	No links affected.	
BAA	24 September 2010	Proposed development lies 38 km in a west south westerly direction from the Aerodrome Reference Point for Glasgow Airport. The area is outside the physical Aerodrome Safeguarding area and therefore the only concern for the airport will be that of potential effect on radars. Glasgow Airport would not object to the proposal.	
CAA	20 September 2010	Recommended to consult BAA regarding the development.	
MOD	29 October 2010	No concerns.	

## APPENDIX C: THE PROPOSED DEVELOPMENT

### Schedule of Mitigation Measures

Potential Environmental Impact	Mitigation Measures
Ecology	<p>Standard best practice mitigation measures are to be undertaken to ensure likelihood of impact events upon Loch Ascog result in non-significant residual effects.</p> <p>The following mitigation measures are proposed:</p> <ul style="list-style-type: none"> <li>• Good construction site management will be implemented to minimise generation of litter, dust, noise and vibration. This will be controlled and monitored through the Construction Environmental Management Plan. Through adhering to best practices during construction and operation phases, fragmentation, disturbance and pollution to habitats present can be minimised<sup>1</sup>;</li> <li>• During construction, management of excavated soil will focus on preventing silt runoff into the water environment during rainfall periods through careful design and maintenance of drainage/silt traps; and</li> <li>• Best practices techniques (correct storage of materials, oils, diesel and sediment traps) should be employed during the construction of the wind energy project structures to minimise risk of pollution and sedimentation of Loch Ascog.</li> </ul> <p><b>Mitigation Measures for Otters</b></p> <p>As otters are known to be in the general area and often forage widely and expand their territories the following mitigation is proposed:</p> <ul style="list-style-type: none"> <li>• All contractors should be made aware of otters and their legal protection;</li> <li>• All personnel are made aware that otters may exist close to the site and are at risk from vehicles;</li> <li>• On site speed restrictions will be put into place for all vehicles, including construction, maintenance and visitors to the site;</li> <li>• All trenches dug during construction and exposed open pipes will be covered at the end of each working day to ensure no risk to otters, or any other wildlife that may have the potential to be trapped; and</li> <li>• Ramps will be located within the trenches or pits that can't be covered to</li> </ul>

<sup>1</sup> As recommended in: 'Good practice during wind farm construction'

Potential Environmental Impact	Mitigation Measures
	<p>allow an exit for any mammal that has gone into a trench or pit.</p> <p><b>Mitigation Measures for Bats</b></p> <p>A precautionary approach implementing standard best practice mitigation measures are to be undertaken to ensure likelihood of impacts upon this receptor result in non significant residual effects.</p> <p>During the construction phase, to ensure minimising disturbance or displacement of bats at present or future roosts, commuting or foraging bats to a minimum, the following mitigation is proposed:</p> <ul style="list-style-type: none"> <li>• Preservation of existing, and planting of new hedgerows in order to encourage bats from the Ascog estate building roost to continue to commute and forage to the feeding area at Loch Ascog;</li> <li>• Considering thoughtful landscaping including planting of hedgerow and trees to enhance existing baseline attributes, increasing connectivity of habitat features and increase food availability and abundance for bats.</li> <li>• Aim to preserve and maintaining existing hedgerow vegetation between Ascog Farm to Loch Ascog;</li> <li>• Bats should be encouraged to utilise existing habitat features through preservation of these features with the objective of attracting bat activity levels to a minimum of a 50 m radius outside of the proposed turbine locations; and</li> <li>• Aim to maintain and enhance wider bat habitat connectivity out with the immediate proposed turbine development area at Ascog.</li> </ul>
Ornithology	<p>With no very high, high or medium significance impacts predicted, there are relatively few issues raised by the ornithological surveys that require mitigation.</p> <p>The main mitigation required is to avoid the destruction of birds' nests during construction. This would be achieved by ensuring that any scrub or tree removal required to facilitate construction of the turbine bases and associated infrastructure (roads and grid connections) would be carried out outside the bird nesting season. If construction takes place on open ground habitats during the nesting period, the site would be checked for the presence of ground-nesting species and work would be scheduled to avoid any nests found.</p>
Landscape and Visual Assessment	<p>The design process has involved a combination of environmental design and engineering to provide an appropriate compromise between maximising energy capture and achieving acceptable design in terms of landscape and visual</p>

Potential Environmental Impact	Mitigation Measures
	<p>issues. Taking account of guidance from planning policy advice and design guidance from SNH; the design has evolved considerably, ensuring that significant landscape mitigation is already 'embedded' within the proposed Ascog Wind Energy Project, prior to the assessment of residual effects.</p>
Cultural Heritage	<p>The principal measure adopted by the scheme to reduce the effect on the historic environment has been the design iteration which resulted in the omission of the fourth turbine from the original scheme. This turbine was located over the site of a recorded settlement at Teyvalley and was located such that it was likely to appear in views of the main frontage of Balmory Hall. Removing this turbine has resulted in a substantially reduced direct effect on known and previously unrecorded archaeological features and has minimised the indirect effect on the setting of Balmory House.</p> <p>As presently proposed, mitigation of the potential direct effects of the scheme can be best achieved by providing for the identification of the tree ring at the summit of the hill of Ascog in work instructions and allowing for it to be fenced for the duration of the construction works to minimise the potential for inadvertent damage.</p> <p>Mitigation of the potential indirect effects of the scheme is harder to achieve. In that the principal characteristics of the assets which may be affected relate to appreciation of their aesthetic or architectural interest, no specific additional measures which would adequately mitigate these effects have been identified.</p>
Landuse and Agriculture	<p>The following mitigation measures will be implemented during the construction of the wind turbines and ancillary infrastructure to reduce the potential for negative environmental effects:</p> <ul style="list-style-type: none"> <li>• Soils (topsoil and subsoil) which is excavated during construction for use in restoration will be handled and stored in accordance with relevant best practices to maintain the integrity and structure of the soil and prevent erosion by wind and water during earthworks and soil storage.</li> <li>• The small clump of deciduous woodland close to the northernmost turbine location will be fenced and protected from any construction works.</li> <li>• Field drainage which is interrupted during construction will be re-instated to maintain the integrity of the drainage system.</li> <li>• Access for stock and agricultural vehicles will be maintained at all times during the construction works and construction working areas fenced off</li> </ul>

Potential Environmental Impact	Mitigation Measures
	<p>to prevent access by stock.</p> <p>In addition, construction activities and their potential for risks to the environment will be controlled through the application of a construction environmental management plan (CEMP). This document will ensure best site practices are adopted on site and will include specific mitigation measures identified in this ES.</p>
Geology, Soils and Hydrology	<p>All construction works will be undertaken in accordance with best site practices for environmental management which will included adherence to all relevant SEPA Pollution Prevention Guidelines (PPGs) and with the outline site construction environmental management plan (CEMP) for this project.</p> <p>The following mitigation measures will be adopted to minimise the risk of impacts on geology and soils from site construction and decommissioning:</p> <ul style="list-style-type: none"> <li>• All topsoils to be re-used on site for restoration following construction or decommissioning will be stored separately from subsoils and in accordance with best soils handling practices to maintain their integrity and prevent erosions from wind and water.</li> <li>• Mobile plant, HGVs and other machinery will operate only within designated construction areas around each turbine site and will access the site using the new access track.</li> <li>• Soils within construction areas which are not to be excavated or form new hardstanding areas will be protected from compaction and other damage through use of appropriate protective measures fencing and geotextile mats.</li> <li>• During decommissioning and subsequent reinstatement maximum use will be made of materials and soils on site, with any excess materials to be removed from site and re-used or recycled in accordance with the waste hierarchy.</li> </ul> <p>No specific mitigation is predicted to be required to prevent impacts to geology and soils during maintenance and long term operation of the wind energy project.</p> <p>The following mitigation measures will be adopted to minimise the risk of site construction and operation works to the aquatic environment:</p> <ul style="list-style-type: none"> <li>• Surface water run-off from the main construction areas will be passed</li> </ul>

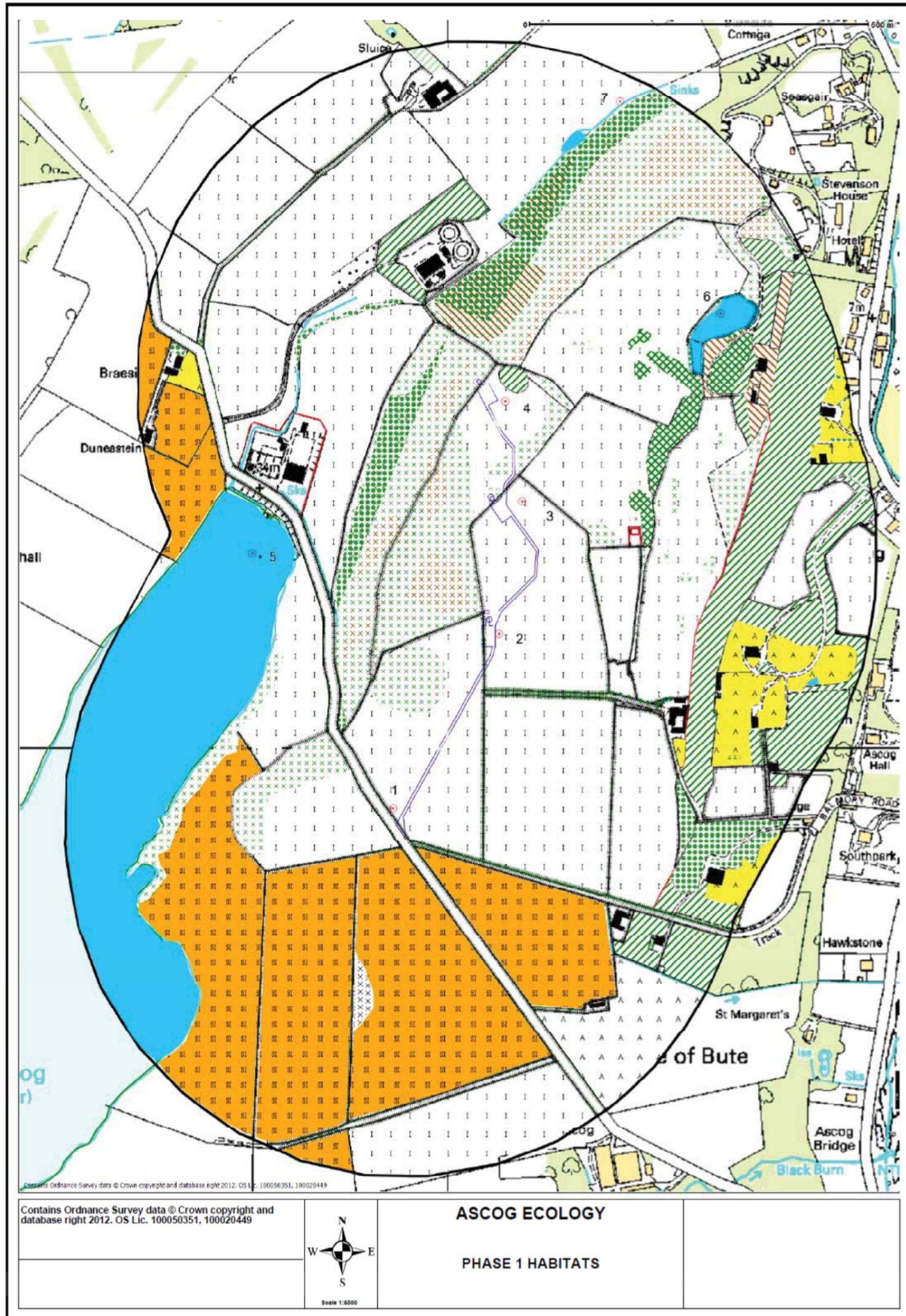
Potential Environmental Impact	Mitigation Measures
	<p>through Sustainable Drainage Systems (SuDS) such as infiltration basins and swales (in accordance with General Binding Rules) to prevent pollution to surface watercourses.</p> <ul style="list-style-type: none"> <li>• In order to prevent pollution during construction a pollution incidence response plan in accordance with the requirements of SEPA PPG 21 will be prepared and adhered to by all site operatives.</li> <li>• Dewatering of excavations for the three turbine foundations will be minimised through undertaking of civil engineering works outwith particularly wet periods;</li> <li>• Construction of the access road and hard standing areas will not be carried out during periods of heavy rain.</li> <li>• No Fuel or oil will be stored on site and any refuelling will be carried out at a designated area at least 10 m away from any drain.</li> <li>• Temporary toilet facilities located on site will be maintained by a SEPA approved contractor.</li> <li>• Measures will be put in place to prevent a build up of silt on the road surface of the adjacent tarred road from vehicle movements to and from the site during construction.</li> <li>• The access road and hard standing areas will be constructed with small earth bunds at either side, a cut-off ditch on the upslope side and a swale on the down slope side.</li> <li>• The grass lined swales will discharge to either small grass lined infiltration basins or sub surface soakaways at regular intervals along the line of the access road.</li> <li>• Cable trenches will be excavated during drier periods of weather with the spoil from the excavations placed on the upslope to prevent surface run-off entering the excavations.</li> <li>• Cable connections will be laid and backfilled as quickly as possible after trench excavation to limit water ingress into the trench.</li> <li>• All disturbed earth works will be sown with grass seed as soon after construction start as possible to stabilise the soil surface and prevent erosion.</li> <li>• Soil stripped during earthworks will be carefully stored and used for creating track verges, earth bunds, swales and infiltration basins.</li> <li>• Where an existing drain is disturbed during construction it will either be diverted round the development or replaced with a sealed drain where it</li> </ul>

Potential Environmental Impact	Mitigation Measures
	<p>has to pass through the development.</p> <ul style="list-style-type: none"> <li>• The foundation for the turbines will be constructed of high grade concrete which does not leach into the surrounding strata.</li> <li>• During the operation phase small quantities of oil and grease will be required on site to maintain and repair the turbines these will be stored according to best practice until required.</li> </ul> <p>It is proposed that SuDS drainage systems installed during the construction phase will be maintained and remain operational for the life of the development.</p>
Noise Assessment	No mitigation measures are proposed at present. Measurement of wind turbine noise after installation to ensure noise impacts are not intrusive may be justified in the case of a complaint.
Access and Transport	Construction activities and their potential for risks to the environment will be controlled through the application of a construction environmental management plan (CEMP). This document will ensure best site practices are adopted on site and will include specific mitigation measures identified in this ES.
Socioeconomic Effects	No measures which would adequately mitigate any indirect effects have been identified.
Other Technical Issues	No further impacts have been identified which require mitigation.

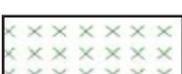
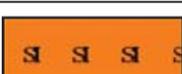
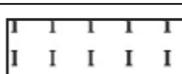
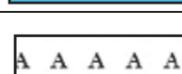
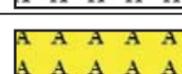
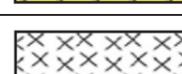
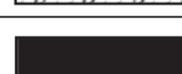
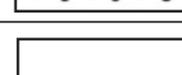
# APPENDIX D: ECOLOGY

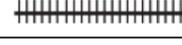
## Habitat Survey Data

Figure 5.4: Phase 1 Habitats at Ascog Farm



**Phase 1 Habitats at Ascog Farm (Ascog Farm Phase 1 Habitat Colour Code Legend)**

Code	Main Habitat Categories
	A1.1.2 Broadleaved woodland - plantation
	A1.2.2 Coniferous woodland - plantation
	A2.1 Scrub - dense/continuous
	A2.2 Scrub – scattered
	A3.1 Broadleaved Parkland/scattered trees
	B2.2 Neutral grassland - semi-improved
	B4 Improved grassland
	C1.2 Bracken – scattered
	C3.1 Other tall herb and fern – ruderal
	G1 Standing water
	J1.1 Cultivated/disturbed land – arable
	J1.2 Cultivated/disturbed land - amenity grassland
	J1.3 Cultivated/disturbed land - ephemeral/short perennial
	J3.6 Buildings
	J4 Bare ground
	J5 Other habitat

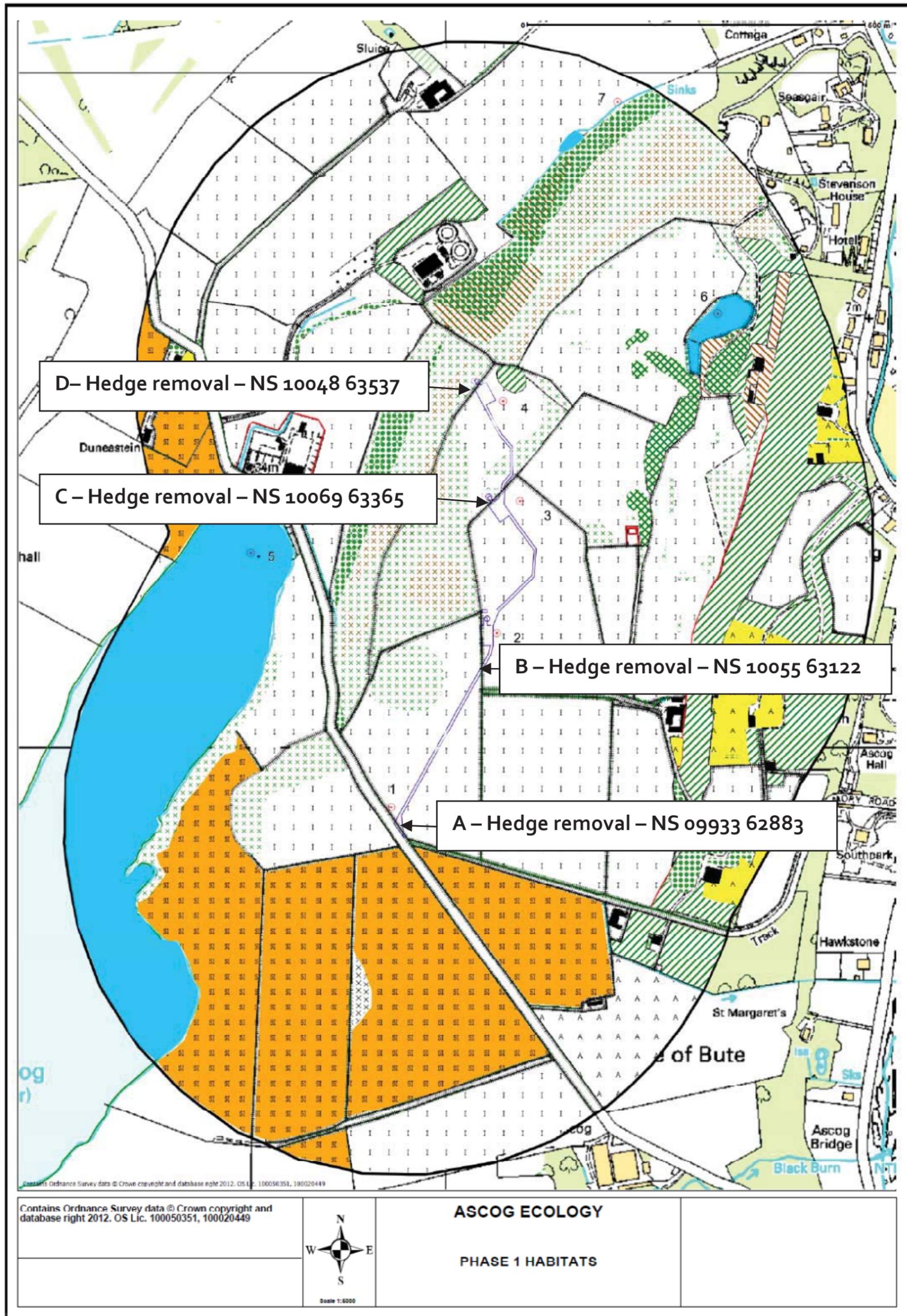
Code	Habitat Boundary Features
	G2 Running water
	J2.1.2 Intact hedge - species-poor
	J2.2.2 Defunct hedge - species-poor
	J2.3.2 Hedge with trees - species-poor
	J2.4 Fence
	J2.5 Wall
	Target note

**Ascog Farm Phase 1 Habitat Target Notes**

Target Note	Grid Reference	Notes
1	Access Track entrance NS09936288	<p>The vicinity of the proposed development – Access Track.</p> <p>The proposed entrance to the access track from the public road. The field boundary currently present at the road comprises a livestock proof picket and fence which is lined with an intact species poor hedge of Hawthorn <i>Crataegus monogyna</i>.</p> <p>The access track dimensions are anticipated to be 4 metres wide and would entail removal of this first hedge and fence to this minimum width (Point A – Figure below).</p> <p>Thereafter the access track would be installed over an improved grassland field which is currently livestock grazed. The trajectory of the track would be north-east and cross a second field boundary at NS10056312 to the first turbine location and associated crane hard standing area at NS10066319. The field boundary here also comprises a livestock proof picket and fence which is lined with an intact species poor hedge of Hawthorn <i>Crataegus monogyna</i>. Removal of this second hedge and fence to this minimum width of 4 metres is anticipated (Point B – Figure below).</p>
2	Turbine 1 NS10066319	<p>The vicinity of the proposed development – Turbine 1 and associated crane hard standing foundations access track and control room.</p> <p>Turbine 1 will be situated upon a 30 metre x 20 m crane hard standing area. To the immediate north, a control room building will be installed at NS10056320 upon improved grassland livestock grazed field. Thereafter the access track alignment will veer north-east and north-west to turbine 2 at NS10066337.</p>

Target Note	Grid Reference	Notes
3	Turbine 2 NS10066337	<p>The vicinity of the proposed development – Turbine 2 and associated hard standing foundations and track.</p> <p>Turbine 2 will be situated upon a 30 metre x 20 m crane hard standing area within improved grassland and scattered scrub field.</p> <p>The field boundary here at NS10066336 comprises a livestock proof picket and fence which is lined with an intact species poor hedge of Hawthorn <i>Crataegus monogyna</i>. Removal of this third hedge and fence to this minimum width of 4 metres is anticipated (Point C – Figure below).</p> <p>The proposed access track will veer north through scattered scrub Gorse <i>Ulex europaeus</i> to turbine 3 at NS10046354.</p>
4	Turbine 3 NS10046354	<p>The vicinity of the proposed development – Turbine 3 and associated hard standing foundations and track.</p> <p>Turbine 3 will be situated upon a 30 metre x 20 m crane hard standing area within improved grassland and scattered scrub field.</p> <p>The field boundary here at NS10046353 comprises a livestock proof picket and fence which is lined with an intact species poor hedge of Hawthorn <i>Crataegus monogyna</i>. Removal of this fourth hedge and fence to this minimum width of 4 metres is anticipated (Point D – Figure below).</p> <p>The proposed access track will terminate at this turbine area.</p>
5	Loch Ascog NS0969363299	<p>A freshwater inland Loch, forming part of the Central Lochs, Bute Site of Special Scientific Interest: <a href="http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=352">http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=352</a></p>
6	Standing Water NS1040363626	<p>An open artificial standing body of fresh water with aquatic vegetation comprising species including Common Duckweed <i>Lemna minor</i>, Water Horetail <i>Equisetum fluviatile</i>, Reed-Sweet-grass <i>Glyceria maxima</i>, Water Avens <i>Geum rivale</i> and Rush <i>Juncus</i> spp. Suitable for supporting amphibians and newts.</p>
7	Ascog Burn NS1025963958	<p>The main freshwater watercourse found within the survey area that runs north-east from Ascog Loch.</p>

Proposed Access Track Field Boundary Crossings - Target notes 1-4



## Ascog Farm Phase 1 Habitat Descriptions

Habitat Type	Percentage Coverage on Site (%)	Habitat/Species Description
B4 Improved grassland	36.92	<p>The dominant habitat present at the proposed development area at Ascog Farm is improved grassland, which is commonly distributed around both the proposed turbine areas, access track route and control room area, reflecting the extensive agricultural use of the site.</p> <p>The improved grassland fields are utilised by livestock and is dominated by agriculturally improved grasses perennial rye-grass <i>Lolium perenne</i>, with abundant cover of White Clover <i>Trifolium repens</i> and Creeping Buttercup <i>Ranunculus repens</i>. Mosaics of Sheep's Fescue <i>Festuca ovina</i> and Thistles <i>Cirsium spp</i> are also found across the site.</p>
B2.2 Neutral grassland – semi-improved	16.04	<p>To the west and south-west of the proposed turbine layout are fields of silage hay grassland in the vicinity of NS0982662660. These grasslands are subject to management including ploughing, cutting and nutrient enrichment. Species comprise Meadow Foxtail <i>Alopecurus pratensis</i>, False Oat-grass <i>Arrhenatherum elatius</i>, Crested Dog's Tail <i>Cynosurus cristatus</i>, Cock's-foot <i>Dactylis glomerata</i>, Meadow Fescue <i>Festuca pratensis</i> and Perennial Rye-grass <i>Lolium perenne</i>.</p>
J5 Other habitat	13.76	<p>These comprise existing tracks, roads, yards and hardstanding areas, such as those found at Ascog Farm.</p>
G1 Standing water	8.83	<p>Freshwater standing waters within the survey area comprise: to the west of the turbine layout, Loch Ascog (Target note 5) at NS0971163345, a pond to the east at NS1036763577 (Target note 6), and a small pool connected with Ascog Burn to the north at NS1018863894.</p>
A2.2 Scrub - scattered	6.70	<p>Scattered and widely distributed, Gorse <i>Ulex europaeus</i> is found over the site. Gorse is abundant within fields to the immediate west and north of</p>

Habitat Type	Percentage Coverage on Site (%)	Habitat/Species Description
		<p>proposed turbines access track and control room along with Bramble <i>Rubus fruticosus</i>.</p> <p>Elsewhere, gorse is scattered over fields, especially towards the north of site amongst improved grassland, and along field boundaries. Amongst scattered scrub which covers slopes to the north of Hill of Ascog and Sewage Works at circa NS1015563659 are scattered stands of Bluebell <i>Hyacinthoides non-scripta</i> (an LBAP species) with occasional pockets of Primrose <i>Primula vulgaris</i>.</p>
A1.1.2 Broadleaved woodland - plantation	6.66	<p>Located to the east of the proposed turbine layout, mature deciduous woodland is found around dwellings at Ascog Farm, Lodge, House, and Mansion in the vicinity of NS1044163279. Species including Sessile Oak <i>Quercus petraea</i>, Beech <i>Fagus sylvatica</i>, Sycamore <i>Acer pseudoplatanus</i>, Ash <i>Fraxinus excelsior</i>, Alder <i>Alnus glutiosa</i>, Silver Birch <i>Betula pendula</i> and Hazel <i>Corylus avellana</i>.</p>
A3.1 Broadleaved Parkland/scattered trees	3.31	<p>Mature scattered stands of Hawthorn <i>Crataegus monogyna</i>, Rowan <i>Sorbus aucuparia</i> and Goat Willow <i>Salix caprea</i> are often found particularly upon slopes to the north and west of the proposed turbine layout at NS1006563665 and NS0989263393 respectively.</p>
J1.2 Cultivated/disturbed land – amenity grassland	1.95	<p>These comprise gardens and mown grasslands that are located around dwellings at Ascog Farm, Lodge, House, and Mansion in the vicinity of NS1042263073.</p>
J1.1 Cultivated/disturbed land - arable	1.64	<p>An arable cereal field found to the south-east of site at NS1027662563.</p>
C1.2 Bracken - scattered	1.25	<p>Scattered bracken <i>Pteridium aquilinum</i> occurs to the west of the turbine layout at NS0999663270 and to the north at NS1029263790.</p>
J3.6 Buildings	1.05	<p>These include dwelling and farm steadings associated with Ascog Farm at NS1033763053 and other farm dwellings over the south-east and north-west of site.</p>
C3.1 Other tall herb	0.85	<p>Areas of tall stands are found to the north of the</p>

Habitat Type	Percentage Coverage on Site (%)	Habitat/Species Description
and fern - ruderal		proposed turbine layout and to the east of a pond at NS1047763587 including Rosebay Willowherb <i>Chamerion angustifolium</i> , Foxglove <i>Digitalis purpurea</i> and Dock <i>Rumex spp.</i>
A2.1 Scrub - dense/continuous	0.73	Dense banks of Gorse <i>Ulex europaeus</i> is found over the site, especially to the north, east and west of the proposed turbine layout. Systematic clearance of scrub was underway during time of survey in summer 2011.
J1.3 Cultivated/disturbed land – ephemeral/short perennial	0.13	A small stand of vegetation along fields to the south-west of site at NS0987262657. Species include Creeping Thistle <i>Cirsium arvense</i> , Meadow Thistle <i>Cirsium dissectum</i> , Cleavers <i>Galium aparine</i> , Ribwort Plantain <i>Plantago lanceolata</i> , Ragwort <i>Senecio jacobaea</i> and White Clover <i>Trifolium repens</i> .
J4 Bare ground	0.12	Farm yards through the site and at the water treatment works by Loch Ascog at NS0978763370.
A1.2.2 Coniferous woodland - plantation	0.06	Mature coniferous plantation occasionally occurs on site, including a livestock wind break of Scot's Pine <i>Pinus sylvestris</i> found to the north of High Bogany Farm at NS0997964007.
G2 Running water	1383m	These comprise the Ascog Burn from Loch Ascog at NS0967863382 to the north-east of site area at NS1030363975. Also field drainage issues along boundaries over the east of site.

### Ascog Farm Phase 1 Habitat Species List

Common Name	Species Name
Sycamore	<i>Acer pseudoplatanus</i>
Velvet Bent	<i>Agrostis canina</i>
Common Bent	<i>Agrostis capillaris</i>
Creeping Bent	<i>Agrostis stolonifera</i>
Alder	<i>Alnus glutinosa</i>
Meadow Foxtail	<i>Alopecurus pratensis</i>
Sweet Vernal Grass	<i>Anthoxanthum odoratum</i>
False Oat-grass	<i>Arrhenatherum elatius</i>
Daisy	<i>Bellis perennis</i>

Common Name	Species Name
Silver Birch	<i>Betula pendula</i>
Marsh Marigold	<i>Caltha palustris</i>
Rosebay Willowherb	<i>Chamerion angustifolium</i>
Creeping Thistle	<i>Cirsium arvense</i>
Meadow Thistle	<i>Cirsium dissectum</i>
Hazel	<i>Corylus avellana</i>
Hawthorn	<i>Crataegus monogyna</i>
Crested Dog's-tail	<i>Cynosurus cristatus</i>
Cock's-foot	<i>Dactylis glomerata</i>
Tufted Hair-grass	<i>Deschampsia cespitosa</i>
Wavy Hair-grass	<i>Deschampsia flexuosa</i>
Foxglove	<i>Digitalis purpurea</i>
Water Horsetail	<i>Equisetum fluviatile</i>
Marsh Horsetail	<i>Equisetum palustre</i>
Beech	<i>Fagus sylvatica</i>
Sheep's Fescue	<i>Festuca ovina</i>
Meadow Fescue	<i>Festuca pratensis</i>
Red Fescue	<i>Festuca rubra</i>
Meadowsweet	<i>Filipendula ulmaria</i>
Ash	<i>Fraxinus excelsior</i>
Snowdrop	<i>Galanthus nivalis</i>
Cleavers	<i>Galium aparine</i>
Meadow Crane's-bill	<i>Geranium pratense</i>
Herb-robert	<i>Geranium robertianum</i>
Water Avens	<i>Geum rivale</i>
Floating Sweet-grass	<i>Glyceria fluitans</i>
Reed Sweet-grass	<i>Glyceria maxima</i>
Yorkshire-fog	<i>Holcus lanatus</i>
Bluebell*	<i>Hyacinthoides non-scripta</i>
Jointed Rush	<i>Juncus articulatus</i>
Compact Rush	<i>Juncus conglomeratus</i>
Soft Rush	<i>Juncus effusus</i>
Larch	<i>Larix decidua</i>
Common Duckweed	<i>Lemna minor</i>
Perennial Rye-grass	<i>Lolium perenne</i>
Wood-sorrel	<i>Oxalis acetosella</i>
Timothy	<i>Phleum pratense</i>
Scots Pine	<i>Pinus sylvestris</i>

Common Name	Species Name
Ribwort Plantain	<i>Plantago lanceolata</i>
Annual Meadow-grass	<i>Poa annua</i>
Smooth Meadow-grass	<i>Poa pratensis</i>
Rough Meadow-grass	<i>Poa trivialis</i>
Broad-leaved Pondweed	<i>Potamogeton natans</i>
Primrose	<i>Primula vulgaris</i>
Bracken	<i>Pteridium aquilinum</i>
Sessile Oak	<i>Quercus petraea</i>
Meadow Buttercup	<i>Ranunculus acris</i>
Creeping Buttercup	<i>Ranunculus repens</i>
Bramble	<i>Rubus fruticosus agg.</i>
Common Sorrel	<i>Rumex acetosa</i>
Sheep's Sorrel [agg.]	<i>Rumex acetosella</i>
Broad-leaved Dock	<i>Rumex obtusifolius</i>
Goat Willow	<i>Salix caprea</i>
Common Ragwort	<i>Senecio jacobaea</i>
Rowan	<i>Sorbus aucuparia</i>
Tansy	<i>Tanacetum vulgare</i>
Dandelion	<i>Taraxacum officinale agg.</i>
Red Clover	<i>Trifolium pratense</i>
White Clover	<i>Trifolium repens</i>
Gorse	<i>Ulex europaeus</i>
Common Nettle	<i>Urtica dioica</i>

\*BAP/LBAP Species

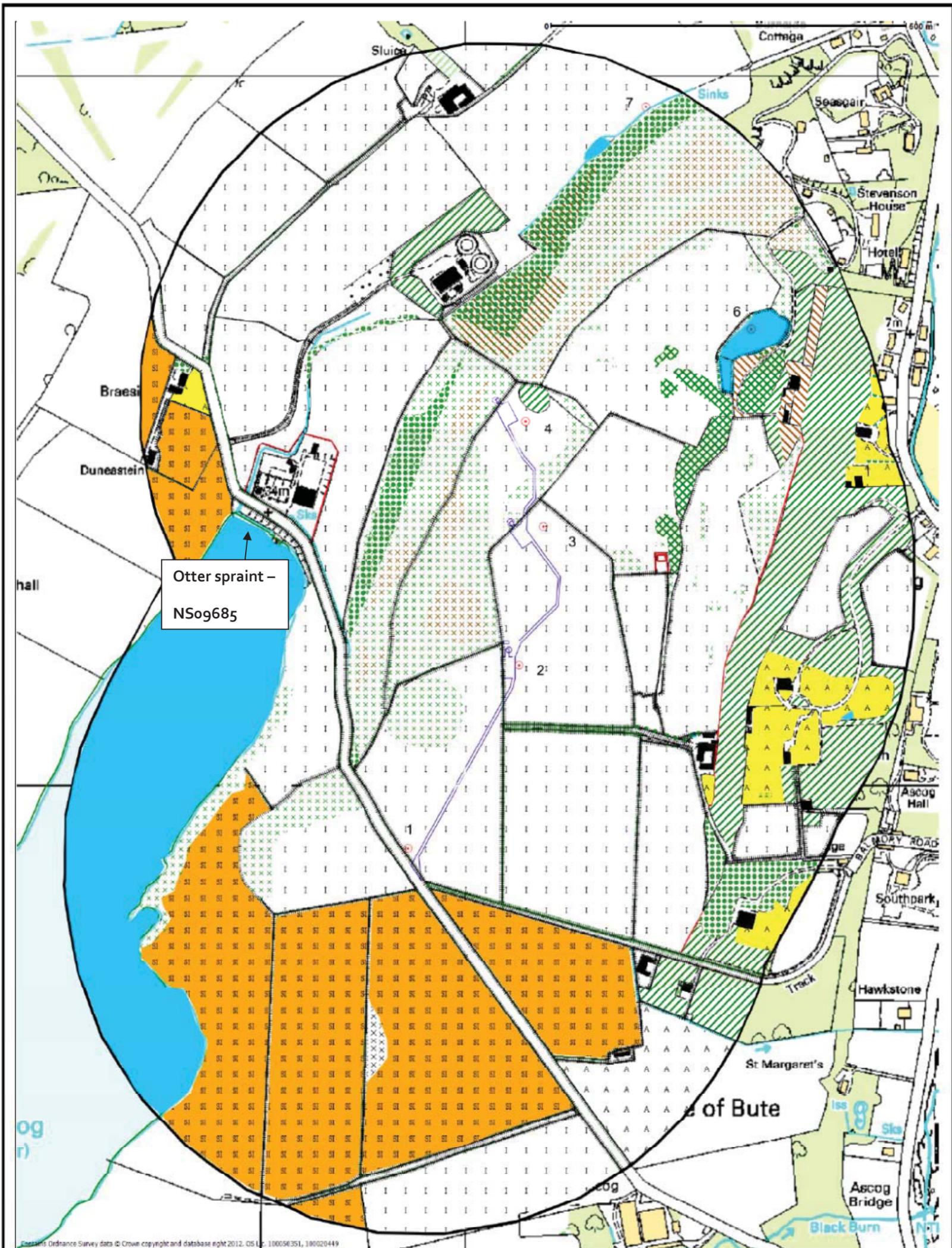
Surveyor: Frazer MacFarlane MIEEM, Horizon Ecology Ltd (Habitats extended to survey for protected mammal species including otters, badgers, water voles, red squirrels and pine marten).

**Weather During Surveys**

<b>DATE</b>	<b>SURVEYOR</b>	<b>START</b>	<b>END</b>	<b>SUNRISE</b>	<b>SUNSET</b>
18/04/2011	FM	13.30	18.00	06.09	20.33
16/07/2011	FM	14.00	18.30	05.00	21.52
16/08/2011	FM	13.35	17.20	05.54	20.53
<b>WEATHER</b>					
Cloud Cover 1/8; Wind W1-2; Temp. 16C.; Visibility > 2km. Dry, water courses at normal flow.					
Cloud Cover 4/8; Wind NW1-2; Temp. 11-14C.; Visibility > 2km. Dry, water courses at normal flow.					
Cloud Cover 4/8; Wind SW3; Temp. 12-15C. Visibility > 2km. Dry, water courses at normal flow.					

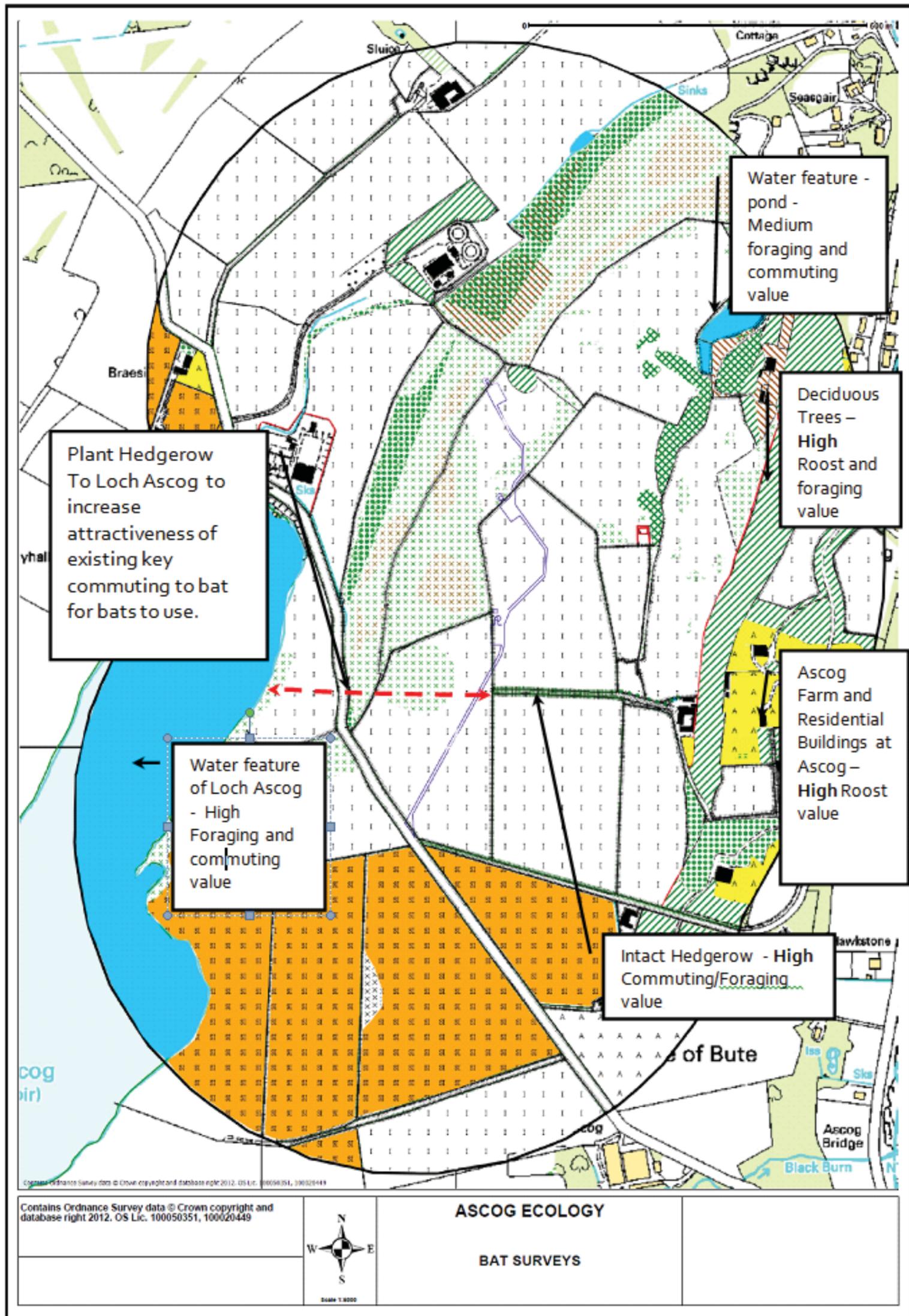
### Otter Survey Data

#### Otter Survey Results at Ascog Farm



## Bat Survey Data

### Bat Habitat Assessment – Optimal Habitat Features at Ascog Farm



**Bat Survey Data**

Date	Type of Survey	Survey Details	Summary of Results															
30/03/2011	Bat Habitat & Roost Assessment (Daytime)	Start – End: 09.40 – 17.35 Sunrise – Sunset 06.55 – 19.55 Weather: Cloud Cover 8/8; Wind W2-5; Temp. 10- 12 C.; Visibility > 2km	Ascog Farm Buildings at NS1033263055 and residential dwellings at Ascog estate identified as potential building roosts.  Mature deciduous woodland at NS104166327 to east of turbine layout also potential roosts.  Hedgerows and scrub lines along field boundaries on site identified as potential foraging and commuting habitat features.  Water bodies including Loch Ascog at NS0972463267 and pond at NS1036863609 identified as potential foraging and commuting habitats.															
20/05/2011	Bat Presence Survey (Dusk)	Start – End: 21.02 – 23.32 Sunrise – Sunset 05.00 – 21.32 Weather: Cloud Cover 3/8; Wind W1-2; Temp. 10C.	Soprano pipistrelle bats recorded on site.  Minimum of 5 individual Soprano pipistrelles (55 Pip) commuting and foraging from east of Ascog Farm over site between 22.06-22.49  Observed height range: 0- 20m: Below Collision Risk Band (CRB). <table border="1" data-bbox="945 1973 1827 2641"> <thead> <tr> <th>Grid ref/ Location</th> <th>Bat Species</th> <th>No</th> <th>Activity / Flight Height(m)</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>NS103566 3111/ East site area</td> <td>55 PIP</td> <td>1</td> <td>Commuting from west of Ascog Farm /3m</td> <td>22.06</td> </tr> <tr> <td>NS104016 3487/ East site</td> <td>55 PIP</td> <td>1</td> <td>Foraging scrub / 2-3m</td> <td>22.18</td> </tr> </tbody> </table>	Grid ref/ Location	Bat Species	No	Activity / Flight Height(m)	Time	NS103566 3111/ East site area	55 PIP	1	Commuting from west of Ascog Farm /3m	22.06	NS104016 3487/ East site	55 PIP	1	Foraging scrub / 2-3m	22.18
Grid ref/ Location	Bat Species	No	Activity / Flight Height(m)	Time														
NS103566 3111/ East site area	55 PIP	1	Commuting from west of Ascog Farm /3m	22.06														
NS104016 3487/ East site	55 PIP	1	Foraging scrub / 2-3m	22.18														

Date	Type of Survey	Survey Details	Summary of Results				
			area				
			NS104546 3672/ East site area	55 PIP	2	Commuting/F oraging scrub / 2-4m	22.24
			NS101196 3578/ North site area	55 PIP	1	Commuting/F oraging scrub / 2-3m	22.49
28/06/2011	Bat Activity Transect Survey 1 of 3 (Dusk & Night)	Start – End: 21.39 – 00.09 Sunrise – Sunset 04.37 – 22.09 West Transect: GM East Transect: FM Weather: Cloud Cover 1- 2/8; Wind SW1-2; Temp. 7- 11C.	<p>West transect area - Turbines 1 -3:- Stopping Points 1, 2 and 6: Primary commuting flight line pathway and Foraging area 1: Minimum of 55 passes of Soprano pipistrelles (55 Pips) commuting to and from west of Ascog Farm to Loch Ascog between 23.37 to 23.49.</p> <p>Primary pathway approximately 92 metres south of nearest proposed turbine 1 at NS 10061 63191 and 326m from foraging/feeding area of Loch Ascog.</p> <p>Stopping Points 3,4,5 and 7: Low numbers of fewer than 5 Soprano pipistrelles (55 Pips) bats -foraging and commuting along hedgerow and other linear edge boundaries.</p> <p>Observed height range between 0- 20m. Average height range 1-3m. Below Collision Risk Band (CRB).</p> <p>East transect area: Stopping Points 8, 9 and 10: Minor commuting flight line pathway: 10 individual Soprano pipistrelles (55 Pips) and 10 passes - foraging tree line and woodland edge between 22.10-26.</p> <p>Minor commuting flight line pathway: Commuting route approximately 296 metres east of nearest proposed</p>				

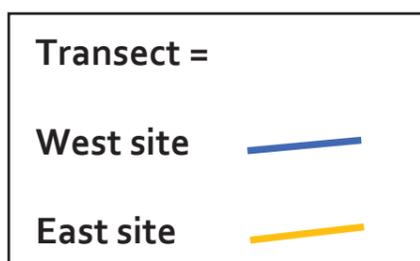
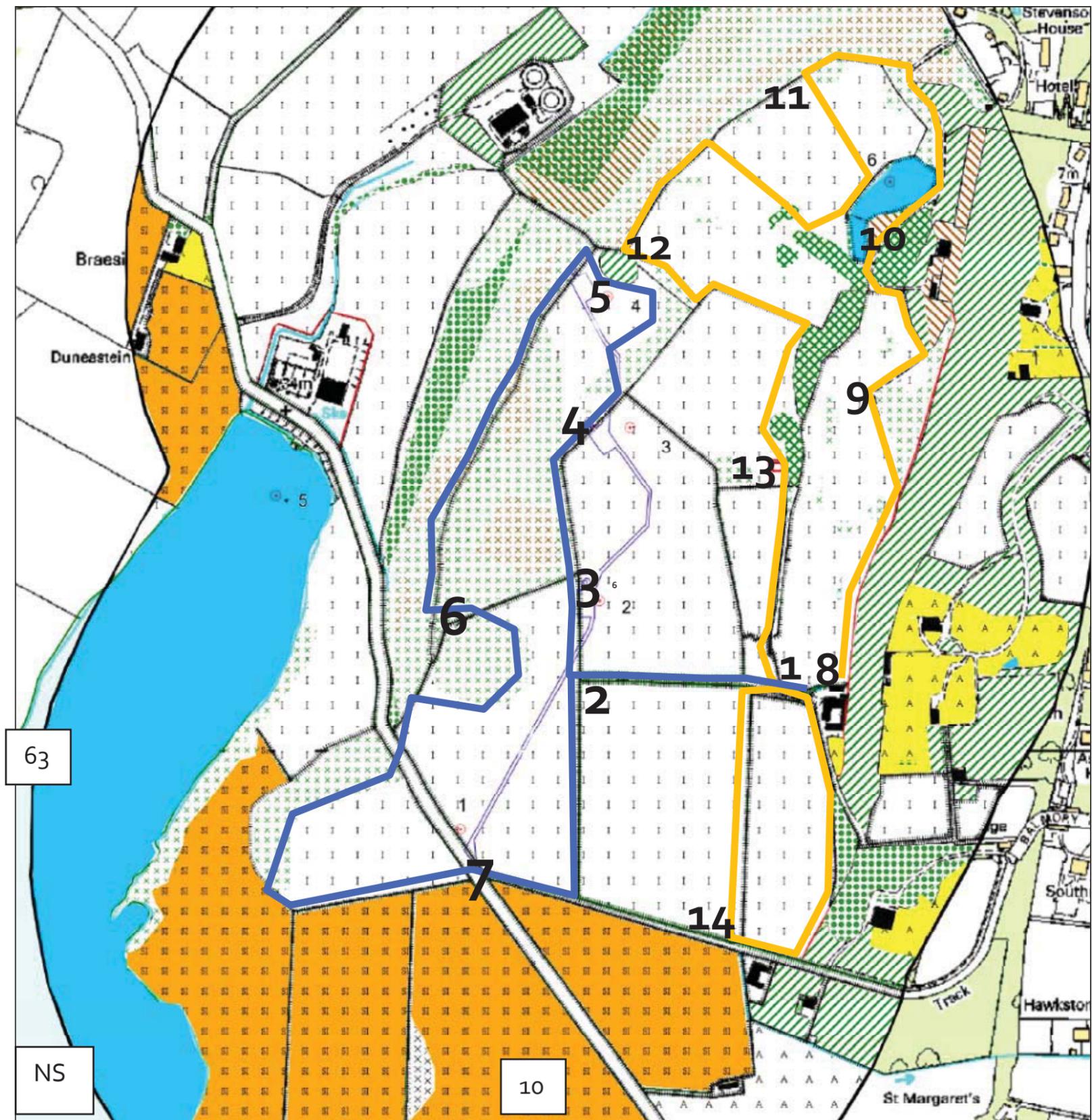
Date	Type of Survey	Survey Details	Summary of Results
			<p>turbine 2 at NS 10064 63371.</p> <p>Stopping Points 11,12,13 and 14:            Low numbers of between 1- 3 Soprano pipistrelles (55 Pips) bats foraging and commuting along hedgerow and other linear edge boundaries.</p> <p>Observed height range between 0- 20 m.            Average height range 1-3 m.            Below Collision Risk Band (CRB).</p>
26/07/2011	Bat Activity Transect Survey 2 of 3 (Dusk and Night)	Start – End: 21.10 – 23.40 Sunrise – Sunset 05.12 – 21.40 West Transect: FM East Transect: GM Weather: Cloud Cover 2/8; Wind NW1-2;	<p>West transect area - Turbines 1 -3:            Stopping Points 1, 2 and 6:            Primary commuting flight line pathway and Foraging area 1:            Minimum of 125 passes of Soprano pipistrelle (55 Pips) commuting from west of Ascog Farm to Loch Ascog between 22.13 to 22.59.</p> <p>Primary pathway approximately 92 metres south of nearest proposed turbine 1 at NS 10061 63191 and 326m from foraging/feeding area of Loch Ascog.</p> <p>Stopping Points 3,4,5 and 7:            Low numbers between 1-3 Soprano pipistrelles (55 Pips) bats foraging and commuting along hedgerow and other linear edge boundaries.</p> <p>Observed height range between 0- 20 m.            Below Collision Risk Band (CRB).</p>

Date	Type of Survey	Survey Details	Summary of Results
		Temp. 13-15C.	<p>East transect area:</p> <p>Stopping Points 8, 9 and 10:</p> <p>Minor commuting flight line pathway:</p> <p>Low numbers between 1-3 Soprano pipistrelles (55 Pips) bats and 13 passes foraging scrub, woodland edge and pond periphery.</p> <p>Minor commuting flight line pathway: Commuting route approximately 296 metres east of nearest proposed turbine 2 at NS 10064 63371.</p> <p>Stopping Points 11,12,13 and 14:</p> <p>Low numbers of between 1- 3 Soprano pipistrelles (55 Pips) bats foraging and commuting along hedgerow and other linear edge boundaries.</p> <p>Observed height range between 0- 20m.</p> <p>Average height range 1-3 m.</p> <p>Below Collision Risk Band (CRB)</p>
31/08/2011	Bat Activity Transect Survey Survey 3 of 3 ( (Night & Dusk)	Start – End: 19.48 – 22.18 Sunrise – Sunset 06.23 – 20.18 West Transect: GM East Transect: FM Weather: Cloud Cover 8/8; Wind W1;	<p>West transect area - Turbines 1 -3:</p> <p>Stopping Points 1, 2 and 6:</p> <p>Primary commuting flight line pathway and Foraging area 1:</p> <p>Minimum of 128 Soprano pipistrelles (55 Pips) passes commuting from west of Ascog Farm to Loch Ascog between 20.33 to 21.25.</p> <p>Primary pathway approximately 92 metres south of nearest proposed turbine 1 at NS 10061 63191 and 326m from foraging/feeding area of Loch Ascog.</p> <p>Stopping Points 3,4,5 and 7:</p> <p>Low numbers between 1-3 Soprano pipistrelles (55 Pips) bats foraging and commuting along hedgerow and other linear edge boundaries.</p> <p>Observed height range between 0- 20 m.</p> <p>Below Collision Risk Band (CRB).</p>

Date	Type of Survey	Survey Details	Summary of Results
		Temp. 9-11C.	<p>East transect area:</p> <p>Stopping Points 8, 9 and 10:</p> <p>Minor commuting flight line pathway:</p> <p>Low numbers between 1-4 Soprano pipistrelles (55 Pips) bats and 12 passes foraging scrub, woodland edge and pond periphery.</p> <p>Minor commuting flight line pathway: Commuting route approximately 296 metres east of nearest proposed turbine 2 at NS 10064 63371.</p> <p>Stopping Points 11,12,13 and 14:</p> <p>Low numbers of between 1- 3 Soprano pipistrelles (55 Pips) bats foraging and commuting along hedgerow and other linear edge boundaries.</p> <p>Observed height range between 0- 20 m.</p> <p>Average height range 1-3 m.</p> <p>Below Collision Risk Band (CRB).</p>
01/09/2011	Roost Survey (Dawn)	Start – End: 04.25 – 06.55 Sunrise – Sunset 06.25- 20.16 Weather: Cloud Cover 8/8; Wind W1; Temp. 7- 10C.	<p>Total count of 85 individual Soprano pipistrelles (55 Pips) commuting from foraging area at Loch Ascog eastwards along primary commuting route between 04.25-06.32</p> <p>Observed height range &lt;20m: Below Collision Risk Band (CRB).</p> <p>Swarming activity observed around residential building at Ascog at NS10478 62973. Several individual Soprano pipistrelles observed re-entering tiles/soffits.</p> <p>Building roost 473 metres east-south-east from nearest turbine at NS10061 63191.</p>

Surveyors: Ecologists: Frazer MacFarlane MIEEM, Horizon Ecology Ltd and Dr. Garry Mortimer, GLM Ecology (Licensed Bat Worker).

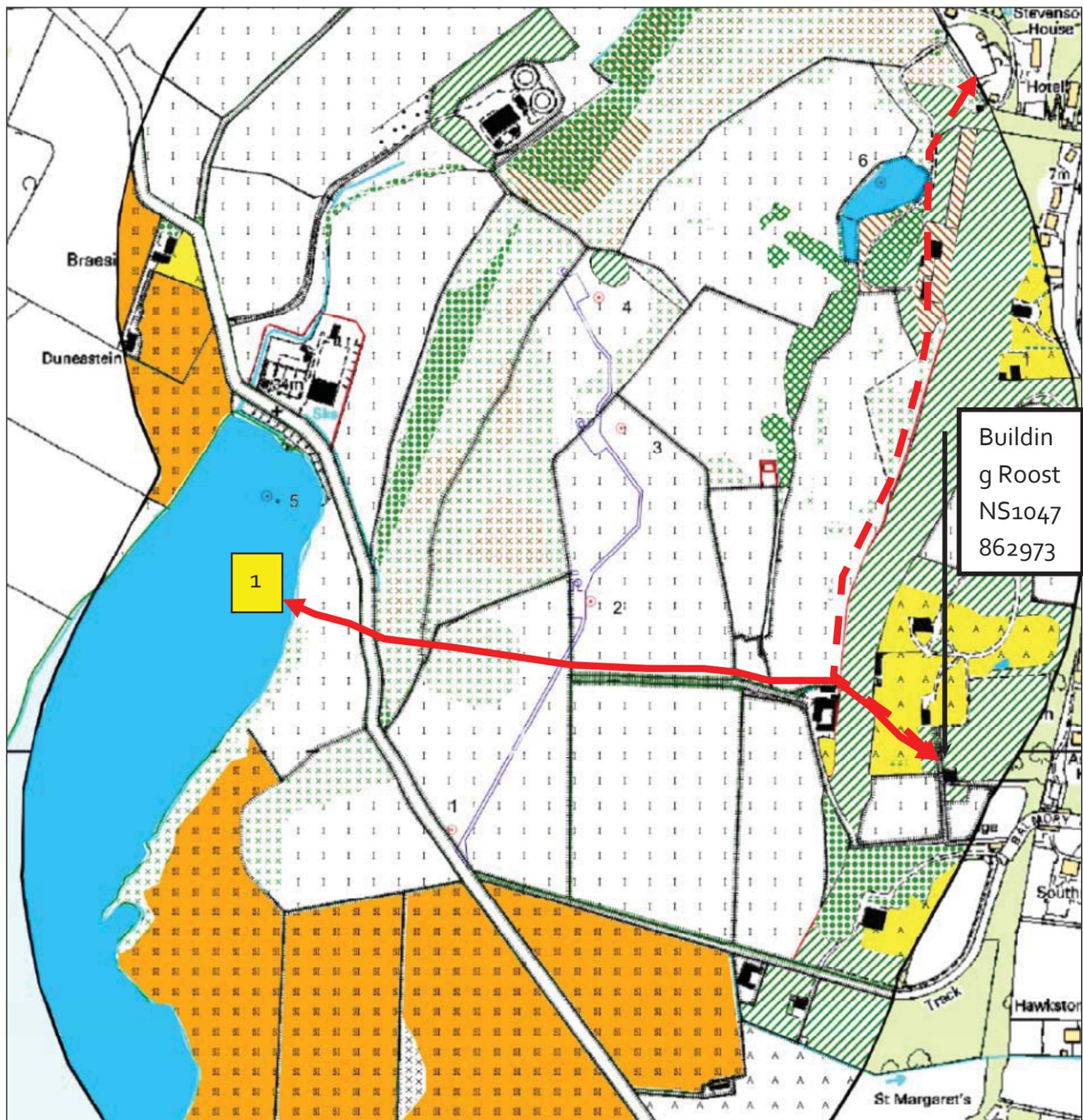
**Bat Activity Transect Survey Area (based upon Bat Habitat Assessment and Phase 1 Habitat Surveys)**



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<b>West Transect (Blue) Stopping Point Grid Reference</b>	<b>East Transect (Orange) Stopping Point Grid Reference</b>
1 -NS1029163079	8 - NS1034963085
2 -NS1005463087	9 - NS1037963407
3 - NS1006463202	10 - NS1038763592
4 - NS1006163349	11 - NS1030763754
5 - NS1007863538	12 - NS1012763564
6 -NS0990963152	13 -NS1025763310
7 -NS0993862867	14 -NS1023062798

### Bat Activity Transect Survey Summary Results



Primary commuting flight line pathway and foraging area: commuting route approximately 92 metres south of nearest proposed turbine 1 at NS 10061 63191 and 326m from foraging/feeding area of Loch Ascog.

Minor commuting flight line pathway: Commuting route approximately 296 metres east of nearest proposed turbine 2 at NS 10064 63371.

Building roost at NS10478 62973 is approximately 473 metres east-south-east of the nearest proposed turbine at NS 100061 63191.

## APPENDIX E: ORNITHOLOGY

### Bird Species recorded within 500 m of proposed Development

Birds recorded within 500 metres of the proposed development during breeding bird surveys and summer vantage point surveys.

BTO Code	British (English)	Scientific name	Birds of Conservation Concern 2009 Population Status	CBC Visit 1	CBC Visit 2	CBC Visit 3	VP Surveys
S.	Skylark	<i>Alauda arvensis</i>	Red		✓		✓
Y.	Yellowhammer	<i>Emberiza citrinella</i>	Red			✓	✓
SG	Starling	<i>Sturnus vulgaris</i>	Red	✓		✓	✓
HS	House Sparrow	<i>Passer domesticus</i>	Red	✓	✓	✓	
TS	Tree Sparrow	<i>Passer montanus</i>	Red	✓	.	✓	
LI	Linnet	<i>Carduelis cannabina</i>	Red	✓		✓	✓
HG	Herring Gull	<i>Larus argentatus</i>	Red	✓	✓	✓	✓
CK	Cuckoo	<i>Cuculus canorus</i>	Red	.	.	.	✓
D.	Dunnock	<i>Prunella modularis</i>	Amber	✓	✓	✓	✓
CU	Curlew	<i>Numenius arquata</i>	Amber	✓			✓
MP	Meadow Pipit	<i>Anthus pratensis</i>	Amber	✓		✓	✓
LB	Lesser Black-backed Gull	<i>Larus fuscus</i>	Amber		✓	✓	✓
BF	Bullfinch	<i>Pyrrhula pyrrhula</i>	Amber		.	.	✓
BH	Black-headed Gull	<i>Chroicocephalus ridibundus</i>	Amber	✓			✓
OC	Oystercatcher	<i>Haematopus ostralegus</i>	Amber	✓	✓	✓	✓
GB	Great Black-backed Gull	<i>Larus marinus</i>	Amber	✓	✓	✓	✓
CM	Common Gull	<i>Larus canus</i>	Amber	.	.	.	✓
M.	Mistle Thrush	<i>Turdus viscivorus</i>	Amber	✓	✓	✓	✓
GJ	Greylag Goose	<i>Anser anser</i>	Amber	✓	✓		✓
WW	Willow Warbler	<i>Phylloscopus trochilus</i>	Amber	✓	✓	✓	✓
WN	Wigeon	<i>Anas penelope</i>	Amber	✓			
RB	Reed Bunting	<i>Emberiza schoeniclus</i>	Amber	✓	✓	✓	✓
SL	Swallow	<i>Hirundo rustica</i>	Amber	✓	✓	✓	✓
K.	Kestrel	<i>Falco tinnunculus</i>	Amber	.	.	.	✓
W.	Wheatear	<i>Oenanthe oenanthe</i>	Amber	✓			✓
LR	Lesser Redpoll	<i>Carduelis cabaret</i>	Amber	✓		✓	✓
HM	House Martin	<i>Delichon urbicum</i>	Amber	.		.	✓
SM	Sand Martin	<i>Riparia riparia</i>	Amber	✓			✓
MA	Mallard	<i>Anas platyrhynchos</i>	Amber	✓	✓		✓
CS	Common Sandpiper	<i>Actitis hypoleucos</i>	Amber	.	✓		
WH	Whitethroat	<i>Sylvia communis</i>	Amber	.	✓	✓	

BTO Code	British (English)	Scientific name	Birds of Conservation Concern 2009	Population Status	CBC Visit 1	CBC Visit 2	CBC Visit 3	VP Surveys
SU	Shelduck	<i>Tadorna tadorna</i>	Amber	.	✓	✓		✓
SI	Swift	<i>Apus apus</i>	Amber	✓	✓	✓	✓	✓
BT	Blue Tit	<i>Cyanistes caeruleus</i>	Green	✓	✓			✓
H.	Heron	<i>Ardea cinerea</i>	Green	✓	✓	✓		✓
GT	Great Tit	<i>Parus major</i>	Green	✓		✓		✓
CH	Chaffinch	<i>Fringilla coelebs</i>	Green	✓	✓	✓		✓
CT	Coal Tit	<i>Pariparus ater</i>	Green	✓		✓		
B.	Blackbird	<i>Turdus merula</i>	Green	✓	✓			✓
WP	Woodpigeon	<i>Columba palumbus</i>	Green	✓	✓	✓		✓
PH	Pheasant	<i>Phasianus colchicus</i>	Green			✓		✓
SK	Siskin	<i>Carduelis spinus</i>	Green			.		✓
MG	Magpie	<i>Pica pica</i>	Green			✓		✓
SH	Sparrowhawk	<i>Accipiter nisus</i>	Green	✓		✓		
JD	Jackdaw	<i>Corvus monedula</i>	Green	✓	✓	✓		✓
HC	Hooded Crow	<i>Corvus cornix</i>	Green	.	.	✓		✓
GO	Goldfinch	<i>Carduelis carduelis</i>	Green	✓	✓	✓		✓
RO	Rook	<i>Corvus frugilegus</i>	Green	✓	✓	✓		✓
C.	Carrion Crow	<i>Corvus corone</i>	Green	✓	✓	✓		✓
R.	Robin	<i>Erithacus rubecula</i>	Green	✓	✓	✓		✓
GR	Greenfinch	<i>Carduelis chloris</i>	Green	✓	✓	✓		✓
WR	Wren	<i>Troglodytes troglodytes</i>	Green	✓	✓	✓		✓
CR	Common Crossbill	<i>Loxia curvirostra</i>	Green	.	.	.		✓
BZ	Buzzard	<i>Buteo buteo</i>	Green	✓	✓			✓
RN	Raven	<i>Corvus corax</i>	Green	.	.			✓
PW	Pied Wagtail	<i>Motacilla alba</i>	Green	✓	✓	✓		✓
CC	Chiffchaff	<i>Phylloscopus collybita</i>	Green	.	.	.		✓
BC	Blackcap	<i>Sylvia atricapilla</i>	Green	✓				✓
CA	Cormorant	<i>Phalacrocorax carbo</i>	Green		✓	✓		✓
MS	Mute Swan	<i>Cygnus olor</i>	Green		✓	✓		✓

## Calculations for Goose Collision Risk Modelling

### A. Probability of a bird flight through the risk window encountering a turbine:

$$P_{\text{TURB}} = A / W$$

Where A=total rotor area, W=area of risk window

$$A \text{ (24 m radius rotor swept area x 3)} = 5428.7 \text{ m}^2:$$

For a 250 metre radius around the three turbines, the risk window averages 675 m wide (859 m at widest point and 500 m at narrowest) and 74 m high.

$$W=1000 \times 80 = 49,950 \text{ m}^2$$

$$P_{\text{TURB}} = \mathbf{0.1086826}$$

### B. Number of encounters with a turbine per day:

Average day length (October – April) is estimated at 10 hours 20 minutes. Allowing for some movement of geese before and after sunrise and sunset, average daily goose activity period is taken to be 11 hours 30 minutes. 48 hours of observation is therefore considered equivalent to 4.17 days.

$$N_{\text{ENCOUNTERS}} = N_{\text{FLIGHTS}} \times P_{\text{TURB}}$$

Using observations within 250 metres of the turbines and assuming that 48 hours of observation is equivalent to 4.17 days in total:

$$N_{\text{ENCOUNTERS}} = (23/4.17) \times 0.1086826 = \mathbf{0.599}$$

### C. Number of encounters with a turbine October - April (212 days):

$$N_{\text{ENCOUNTERS}} = 0.599 \times 212 = \mathbf{126.99}$$

### D. Collision probability for a bird encountering a turbine:

From SNH spreadsheet (Band Model)  $P_{\text{COLL}} = \mathbf{10.1\%}$

Using the following figures:

No. Blades	3
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MaxChord (m)	1.5
Pitch (degrees)	14
Bird Length (m)	0.68
Bird Wingspan (m)	1.52
F: Flapping (0) or gliding (+1)	0
Bird speed (m/s)	17.5
Rotor diameter (m)	48
Rotation Period (s)	2.45

### **E. Estimated number of collisions (October-March) assuming no avoidance**

$$N_{\text{COLL}} = N_{\text{ENCOUNTERS}} \times P_{\text{COLL}}$$

$$N_{\text{COLL}} = 126.99 \times 0.101 = \mathbf{12.83}$$

### **F. Application of SNH recommended 99% avoidance rate for geese**

Final collision estimate =  $12.83 \times 0.01 = 0.1283$  geese per annum (1 goose collision every 7.8 years)

### **References**

SNH (2000). Windfarms And Birds: Calculating a theoretical collision risk assuming no avoiding action.

SNH (2010) Use of Avoidance Rates in the SNH Wind Farm Collision Risk Model

## **Ornithological Survey Maps**



**Figure 6.1: Composite map of Greylag Goose activity over 48 hours of vantage point survey between October 2010 and April 2011**

 Goose flightpath observed  
 Field used by feeding geese

 Proposed turbine  
 250m & 500m buffers around turbines  
 Proposed access road

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